

your computer

August, 1982 \$2.00* NZ \$3

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REVIEWS: SINCLAIR ZX SPECTRUM, SIGMA/OKI • PRINTER TESTS: NEC SPIN-WRITER, CASE COLOUR, AND MORE • MICROBEE COLUMN • BIG POCKET PROGRAMS SECTION • APPLE GAME REVIEWS • PASCAL ADVENTURE

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Your Computer News

Our roundup of the latest in software and hardware, new and upcoming releases and happenings in the world of microcomputers.

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Dick's Modem

YC has a Dick Smith direct-connect modem for test. We can't bring you the detailed technical report until next issue, but we've tried it. Here's our preliminary findings.

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A Classy School

We thought of sending the Office Idiot, but instead we sent a computer novice/businessman to sample Applied Computer Science's two-day course. He learned more in that time than the OI has in two years...

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Applegaming Action

Playing Foosball, battling the Minotaur, or chasing the Graf Spee — it's all good fun. Peter Sandys looks at some of the latest Apple games.

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Pascal Adventure

G-Pascal author Nick Gammon presents a clever adventure game in Pascal — add it to your collection, or follow the easy instructions to turn it into a full-scale epic to rival Crowther and Woods.

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Pocket Programs Special

A continuation of our special devoted to pocket programs. This month, we have 10 pages devoted to games and utilities you can run on your machine.

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Leon Tackles Texas

Leon Yendor comes out of hiding to visit the NCC (National Computer Conference) in Texas. There's even a photograph of our mysterious columnist at the show...

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MicroBee Special

This month we launch a regular MicroBee column, plus present reports from an owner and an observer who wants to encourage Bee buyers to 'do something different' with their machines.

For beginners

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Basic For Birdwatchers

Part Ten of Les Bell's instructional series on BASIC. This month, he looks at linked lists.

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This is where we set out to solve your problems — and try not to create more for you in the process...

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Spectrum Analysis

One of our resident Sinclair fanatics, Graham Webber, takes a hands-on look at the new ZX Spectrum colour machine.

23

OKI's OK Oriental

If it had nothing else going for it the OKI would win friends with its stunning graphics — our cover is an example of what it can do — but there's even more to it than that. It's just one of the new wave of Japanese machines that will

give the traditional makers a headache.

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Gee, Pascal's Good

No language system needed, no RAMcard needed, and hardly any money needed...Les Bell looks at an excellent locally written compact Pascal implementation for the Apple.

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Print It!

The second part of our printer survey looks at four popular printers, from cheap-and-nice to four-colour graphics:

- Case CX-80
- Itoh 1550
- Star DP8480
- Anadex DP-9501A

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Text File

Your words, our pages...

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Linton-Simpkins

Anarchy by computer! Frank suggests a new way of government, from the lounge-room.

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Popular Systems

Individual columns devoted to the popular systems, including two newcomers — the Peach, and the MicroBee.

98

Readers' Services

Want to contribute a story, write a program, ask a question, subscribe, sue us or...? Read this first.



What's the Sinclair colour machine, the ZX Spectrum, really like? When will we get it, and what will it cost? Local Sinclair fan Graham Webber tries the Spectrum, and tries to find answers to the other questions, on page 20.



Graphics is a big feature on many printers these days, including most of those featured in our printer test special on page 66. This one's from the Case CX-80 — and it's in colour!

NEXT MONTH

For starters, next month we'll run the NEC Spinwriter test mentioned on this month's cover! Again, the space grem-lins caught up with us.

Unfortunately, our covers are printed more than a week before the rest of the magazine is finalised — late changes are unavoidable, and sometimes we get caught out.

To make up for it, we'll run a twin-test...the top-of-the-line Spinwriter, and the less well-known down-market model, the 3510 Spinwriter.

We also hope to bring you a communications special, including details of protocols for handshaking terminal programs, interactive games you can play over the telephone lines through modems or direct from machine to machine, and more.

editorial

THAT AUGUST and venerable organization the Australian Computer Society has apparently taken its final step into cloud-cuckoo land with its recent decision to admit only computing graduates to membership after 1983. There's nothing very terrible about that decision of itself, but the implications will, I believe, be quite damaging for both the computer community and the ACS.

The *raison d'être* of any professional body is surely to raise the standards of practice of the associated profession. This quasi-educational role is particularly important in the high technology area, where a formal degree or certificate course can only provide a 'snapshot' image of the current state of the art and frequent updates are necessary.

What particularly concerns us (and many industry observers) is that the motivation for this move is apparently a desire to raise the status of the DP professional in the eyes of the general public to a level similar to that enjoyed by doctors, solicitors and other professionals.

Arrant nonsense, and a move back to the 'high priesthood' and witch-doctory that used to surround big systems. The public knows by now that programming a computer is not as difficult as they were told — God knows, their kids do it so well!

The fact is there is a vast army of people in the computer industry who do not have degrees, but entered it as operators and worked their way up, or side-stepped from other professions.

With current trends to smaller, more powerful and more 'friendly' computers, fewer and fewer DP professionals will have formal qualifications in the field. Nonetheless, they will be equally as technically competent, if not more so, than the current industry levels, and just as professional in their approach.

And the ACS proposes to exclude these people!

What's going to happen is that the industry will split; one group (by far the biggest) is going to get on with its job in a professional manner, ignoring the ACS and keeping itself abreast of the industry, while the dwindling ACS membership, secure behind its self-proclaimed badge of integrity and accomplishment, progressively loses touch with reality in its race to get on nodding terms with the doctors and barristers at the golf club bar.

It's all a great pity, because the industry does need a body which is relevant, helps to maintain professional and technical standards, and provides training and special interest groups. Who knows, maybe someone will start one? They could call it the ACS, for *Alternative Computer Society*. □



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CW Electronics,
416 Logan Road,
Stones Corner, QLD. 4120.
Phone: (37) 397 0808



your computer news

Sinclair 64K!

ZX80-ZX81 and Microace fans might care to know that they can put big-machine memory capacity into their mites — a 64K RAM expansion package has been released locally.

The Memopak 64K RAM is similar to the 16K RAMPak presently available. The Memopak plugs directly into the ZX81 (the ZX80 and Microace require a minor modification). Memopak includes 2K EPROM monitor, and graphics which can be called by the BASIC USR function or by machine code.

The 64K Memopak is available for around \$376. A 32K Memopak is available for around \$299.

A 4K Graphics ROM (around \$99) which fits inside the computer is on its way. The graphics module gives you 1024 pre-programmed

graphics characters including inverse, lower case, bombs, bullets, rockets, tanks and Invaders characters.

The graphics module also has a spare holder which can accommodate up to 4K ROM/RAM. The holder can be used for a Tool-Kit ROM (coming soon), 1K or 2K UDG giving 128 or 256 user-definable graphics characters. Machine code can be stored and run with RAM in the holder.

The module does not interfere with the use of 16K RAM or printer. Graphics can be printed on the printer with the addition of 3 solder connections. A character generator program is available for use with the UDG.

Other peripherals available soon include a high-res graphics pack (248 by 192 pixels) at about \$352, RS232

interface and a Centronics printer interface.

For further information contact Mike Eisenblatter on (08) 381 2644 or Shane Arnfield on (08) 298 7919, or write to PO Box 61, Happy Valley, 5159. □

Demand A Document

ANACOM General Corporation has announced the 160/160Z 'Demand Document' printer which, it claims, virtually ends wasted forms, labels, paper and so on.

The paper drive mechanism is said to eliminate the need to reposition the paper and/or to remove the paper from the drive mechanism.

The new 'Z' package, available locally through Paris Radio Electronics in Darlinghurst, Sydney, includes six character sizes, dot addressable graphics, horizontal and vertical tabbing, a 4K buffer

and a choice of four character sets.

For further information contact Bill Haynes, Paris Radio Electronics, on (02) 344 9111. □

Magazines Indexed

ADAM PRESS has recently published a classified index to microcomputing magazines of 1981.

The index contains nearly 3000 entries concerning articles published in eleven generally available popular microcomputing magazines. Many of the entries also give a descriptive outline of the article.

To enable easy location of any particular article or series concerning a particular subject, the entries have been listed according to subject. There are almost ninety classifications listed.

It costs \$6 a copy and is

A Quick Look At The

AS WE REPORTED last month, Dick Smith Electronics has released a Telecom approved direct-connect modem, the 'Dataphone'.

Your Computer received a unit for review the day before going to press, so we thought we would provide a brief rundown now for those who can't wait for next month's full evaluation.

To date most microcomputer users have used acoustic couplers to communicate with remote computers (micro or otherwise). Acoustic couplers have no direct connection to the telephone line, the data is converted to an FSK format and then to sound waves and 'coupled' into the normal telephone handset.

This is not a very efficient manner of transferring data from a computer to a telephone system, but it does avoid any electrical safety problems for both Telecom and the users. Acoustic couplers are also inconvenient to use because you have to juggle the handset of your telephone into the cups of the coupler after initiating the call to the remote system.

A much better system is direct connect, where the data from your computer is directly converted to FSK signals on the telephone line without having to be converted to audible sound waves.

Very good high voltage protection is required to prevent dangerous voltages from your computer getting onto the telephone line and vice versa. Direct connect modems can consistently put a much stronger signal into the telephone line and

reliably recover weaker signals from the remote system.

Direct connect modems are convenient to use as they are just switched onto the line after initiating the call to the remote system, and the handset can be placed back on the telephone. Until now, the only direct-connect modems that have been readily available have been from Telecom at high rentals (typically around \$500 a year).

The Dataphone modem has a Dick Smith part number of X-3272; the stores should be accepting orders by the time you read this. The modem is locally designed and is locally manufactured by Dick Smith Distributors.

The first thing I did was to take the top off to have a look inside. All the electronics are on a single printed circuit board.

There are seven ICs (including the ubiquitous EXAR 2211), half a dozen trim pots, one transistor, a three terminal regulator, an isolation transformer, an encapsulated high voltage protection capacitor and the usual assortment of resistors and capacitors. The unit I have for review is an early production model and has some trace cuts and wire jumpers on the PCB, but I believe that a corrected PCB has now been done. Overall construction was satisfactory.

The unit is housed in a plastic case measuring around 205mm by 160mm by 65mm and, if turned so the switches are on the side, will fit quite neatly underneath a standard telephone.

On the front panel are two LEDs, a red one indicating power is on and a green one indicating if carrier from the remote

available from Adam Press at
31 Creswell Street, Camp-
bell, 2601. □

Colour Computer News
NOW AVAILABLE in Au-
stralia through Paris Radio
Electronics in Darlinghurst,
Sydney, is a new magazine
for Tandy Colour Computer
owners, packed full of the
latest gear from America.

There are also plenty of
contributed games — if you
like typing. Colour Computer
News, at around 95 pages,
sells for \$4.95.

Also available is a detailed
MC 6809/MC 6809E Micro-
processor Programming
Manual. The manual covers
in depth the MC 6809 Micro-
processor and its internal
workings. Also included are
monitor listings and fairly ex-
tensive machine code re-
ference charts.

It retails at \$19.95. □

Anti-Static Mat

DRY AIR and cool days might
be the simple answer to your
reliability problems — static
electricity has zapped our of-
fice computers into dream-
land on several occasions.

There's a solution, in the
form of an anti-static floor mat
being imported by Sydney's
Heritage Trading Company.
The mat, a development of
the office mats used under
roller chairs, is designed to
prevent malfunctions in
costly and delicate electronic
equipment caused by static
electricity.

The mat is made from a
conductive vinyl and has a
three-metre earthing cord
which connects it to ground.
With the mat installed in front
of a computer terminal
(where users will have to
walk on it to reach the key-
board), it effectively grounds
any static charge that has

been picked up walking ac-
ross a carpet.

When you consider that
the human body can develop
and transmit 20,000 volts
without harm, you begin to
realise how static could
wreak havoc with your data.
Levels of 3000 volts would
pass unnoticed by humans,
but can cause significant
malfunctions in sensitive
electronic equipment.

The earthing cord has a
built-in one megohm resistor
for the prevention of 'back
shocks'. The mat also has
'hooks' on its underside
which prevents it moving.

The mat costs around
\$200 to \$240, depending on
size.

For further information
contact the Heritage Trading
Company at 7 Gibbons
Street, Carlingford, 2118.
Phone (02) 683-3469 or (03)
720-1277. □

Sandy's Update

YOU HAVE to give Sandy's
Word Processor author
James 'Sandy' Donald points
for speed.

Last month we reviewed
the Digicard-80 Apple 80-
column card, which we rated
highly, but our reviewer dis-
covered the Sandy's shift key
would not function correctly
with the card — it required
one press for each upper
case character required, un-
less used in shift-lock mode.

Sandy Donald was on the
phone to us within a week —
he had fixed the problem, and
his program is now fully com-
patible with Digicard-80 card.

He also said there would
be more big news coming
soon. We expect that means
a revamped version, using
his spectacular FastDOS for
speed improvements along
with other updates. □

Dick Smith Modem

By Bill Bolton

system has been detected by the modem. Also on the front
panel are two switches; one selects Phone or Modem, while
the other selects Originate or Answer modes.

On the back panel there is a DB25 (RS-232) connector and
cords for power and phone connections. Power for the unit
comes from a plug pack type transformer which is permanently
tethered to the unit.

The phone cord has a 604-type plug on the end, the normal
Telecom 'special device' plug — that is, it won't fit into an
ordinary phone socket. You need to have Telecom wire a
matching plug into your phone line to connect the modem. This
costs around \$40 have fitted and a few dollars a year extra in
rental.

If you already have a properly installed telephone answering
machine you should already have the socket. The socket
allows you to disconnect the modem by unplugging it and still
have the phone work normally.

The pre-production unit supplied for review came without
any documentation of any sort, so I cannot comment on that.
Hopefully when the unit goes on sale the accompanying
documentation will cover what you have to do to legally con-
nect the modem to the phone line. The unit is claimed to
conform with the EIA RS-232C standard, CCITT standards
V.28 and V.21 and ISO standard 2110.

Okay, that's enough of the technical detail, how does it
work? Well as I said earlier, I've only had two days to test it so
far. I've used it to connect to my RCPM system, the MiCC Bulletin

Board, MIDAS and several commercial and university time-
share services in the Sydney area, from several different
locations. I have previously worked from all the test sites with
acoustic couplers and had experienced difficulties getting onto
some of the systems.

The Dick Smith direct connect modem worked well from all
locations. There were still some systems (fewer than previ-
ously) that I could not reliably complete a connection to but in
each case the direct connect modem allowed me to get much
further into the login dialogue than the acoustic couplers had.

Direct connect modems will not solve chronic bad-line prob-
lems but obviously will give much better performance than
acoustic couplers under similar conditions.

The unit is convenient to use and has performed reliably
over the (short) test period to date. It has Telecom approval
(C82/37/557) and so must meet CCITT V21 standards for 300
baud operation. I had no problems connecting it to several
different types of computers.

Briefly I think Dick Smith has a winner with this modem. It is
very competitively priced (at \$169) compared to any of the
currently available acoustic couplers and offers clearly super-
ior performance and convenience.

This product, more than any other to date, should give the
micro-communications explosion an added impetus. At this
stage my simple recommendation is....why haven't you placed
your order yet? □

STOP

(Read this now!)

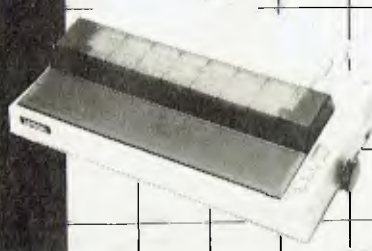
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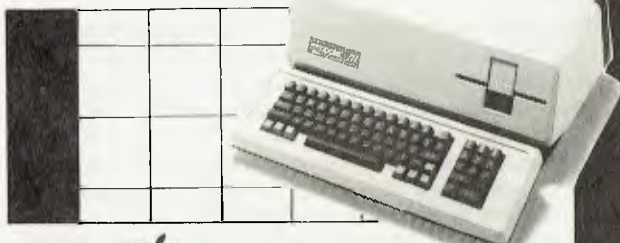


EPSON

Australia's most popular printers, the Epson MX80 and MX 100 type III F/T's offer high quality printing in a variety of sizes and styles, 100 c.p.s. print speed and full graphics capability. Interface options include parallel and RS232 serial, as well as the Apple graphics interface. And C.P.C. now offers a full 12 month warranty on all Epson printers. Come and see them in action at one of our stores.



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Smart Dumb Smart Terminal

A LOW-COST smart Lear-Siegler video display terminal featuring a new space-saving design and detached keyboard has been released by AWA. The new ADM 22 bears a stylistic resemblance to its illustrious predecessor, the ADM 3, which introduced the now-familiar 'clam-shell' shape.

The terminal is said to feature high reliability, with a mean time between failures (MTBF) of 10,000 hours. Functionally, the ADM 22 retains a mixture of the features found in the ADM 3, 5 and 31 terminals, and is also compatible with the Hazeltine 1500 and ADDS Regent 25 terminals.

Key features include complete visual attributes, seven function keys, full editing capabilities, a status line, block mode transmission and graphics mode operation.

The LSI ADM 22 is priced at \$1015. For further details contact AWA, PO Box 96m, North Ryde, NSW 2113 or telephone (02) 888 8111.

ICL Winners

TWO guests who each won an ICL Personal Computer at the recent Traderpoint launches in Sydney and Melbourne have been presented with their machines.

The winners were Keith Cottee of Stony Creek, South Gippsland, Victoria and John Geerligns of Sydney. Their names had been drawn at random from the launch guest lists.

Traderpoint is an organisation set up by ICL to sell products and services through third party organisations. Guests at the launches included office equipment and computer dealers, retailers, and representatives from software houses, bureaux, systems houses and OEMs.

The ICL Personal Computer is basically a Rair Black Box, and runs the CP/M and

MP/M II operating systems. ICL is providing a wide range of software support for the machine, which is available from a number of computer stores.

GTCO Adapts Digi-Pad

A SIMPLE EPROM firmware option which allows the GTCO Digi-Pad 5 to emulate all functions of the Summagraphics serial Bit Pad has been released by the TCG Group, Sydney.

The change converts GTCO's high resolution output format into a low resolution format that is identical to that of the Bit Pad, and duplicates all Bit Pad functions, including remote control. These features include incremental output mode, output rates up to 200 points/second and a four tone audible alarm for self-test and feedback.

In addition, the Digi-Pad can be mounted under a table, as it will operate through a one inch thickness, and it has no bar magnet which can disrupt nearby displays, since it uses electromagnetic scanning.

Other options include translucent and rear projected tablets, a 16-button cursor, remote XY display and remote keyboard input. Further details from TCG Systems Automation, 33 Hume Street, Crows Nest, NSW 2064. Tel (02) 439 6477. □

Osborne Big Video

OSBORNE 1 computer owners who want to use an external video monitor now have a neat alternative to Osborne's Mondapt external adapter.

Boulevard Business Services of Canberra now produce a small plug-in video adapter which fits inside the computer. This saves the continual plugging and unplugging of the Mondapt needed whenever the computer is moved, as well as re-

lieving strain on the external video connector.

The BBS video adapter is supplied fitted for only \$44.95. As an introductory special offer for the next two months, BBS will 'trade in' your old Mondapt and fit its video adapter for half price. For further details, ring Boulevard Business Services on (062) 48 5411. □

Apple Arrives

APPLE Computer has announced the establishment of its Australian subsidiary.

Well, actually, it hasn't announced the establishment of its subsidiary, it has announced the appointment of David Strong as its general manager in Australia — but presumably he must be general manager of something.

The local Apple operation

will not supplant the activities of Electronic Concepts in distributing Apple here. The role of the new organisation will primarily be one of training and dealer liaison, particularly in the area of key accounts.

Announcing the appointment, Gene Carter, Apple's VP for Sales, explained that this was the first stage in the establishment of a wholly owned Apple subsidiary in Australia.

In fact, Australia is Apple's fastest growing international market, with over 15,000 units sold to date (the worldwide total is about 450,000 units).

Carter also took the opportunity to talk about Apple's recent performance. It appears that IBM's entry into the market has not done as much damage as had been feared. For the quarter ending June 25th, Apple's net sales in-

creased 57 percent over the same period last year, and net income was up 28 percent.

During the first nine months of the year, the company spent US\$28.3 million on research and development.

While Apple executives still refuse to recognise the word 'Lisa' (the codename for Apple IV), it is apparent that something must be brewing in the back room. Apparently a lot of work is being done to simplify the user interface with the machine, and to hide the operating system from the user. Comments from Carter about the machine being revolutionary rather than evolutionary suggest the Apple IV will be quite different from its predecessors.

In addition, there are signs that the software drought for the Apple III is coming to an



MR DAVID STRONG

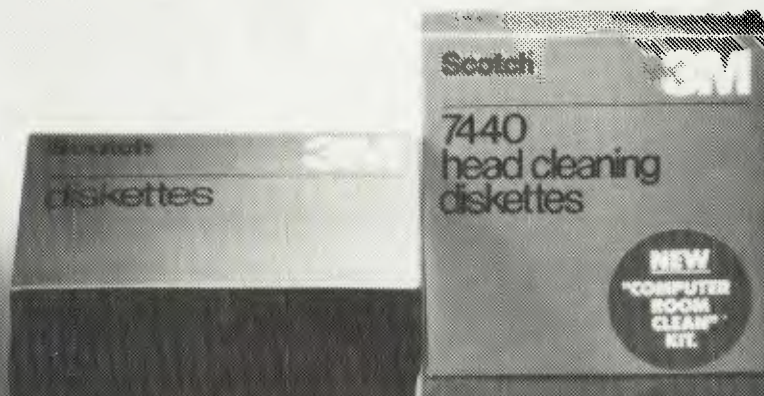
end. Apple has apparently managed to woo back the software houses who were massively unimpressed with the machine's launch, and a range of software is nearing completion, including Australian accounting packages. □

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CCS 4 Serial Ports	\$325
CCS 4 Parallel Ports	\$225
CCS 2 Serial 2 Parallel	\$350
CCS 12 slot mainframe	\$699
CCS Disk Controller	\$430
Morrow Disk Controller	\$399
Morrow DMA Disk Cont	\$475
Morrow 64K static RAM	\$525

APPLE

CCS Rom/Prom	\$99
CCS Calendar Clock	\$110
CCS Timer	\$110
CCS Analog — Digital	\$99
CCS Parallel I/O	\$99
CCS Centronics I/O	\$99
CCS Synch Serial I/O	\$150
CCS Asynch Serial I/O	\$150
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CCS Arithmetic Processor	\$299
CCS GPIB IEEE-488	\$195
CCS Wire Wrap	\$25
CCS Solder Tail	\$25
CCS Extender Board	\$25
CCS Rom Pack	\$20
CCS Ram Pack	\$20
CCS Apple Clip	\$5
Microsoft 16K Ram Card	\$125
Microsoft Soft Card	\$340
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5" MPI 80 track	1 side \$385
5" MPI 80 track	2 side \$515

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Cobol 80	\$695
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Macro 80	\$195
Fortran 80	\$495
MuLisp/MuStar	\$195
MuMath/MuSimp	\$240

MISCELLANEOUS

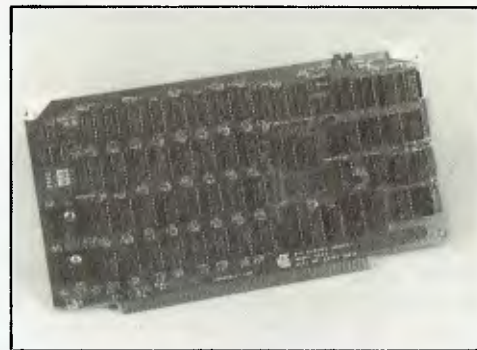
Pearl program generator	\$150
Pearl 2	\$300
Pearl 3	\$500
Plan 80 financial mgmt	\$240
Sid symbolic debugger	\$105
ZSid Z-80 Sid	\$130
ACT cross assembler	\$190
MAC macro assembler	\$125
Pascal M	\$175
Pascal MT+	\$475
Cbasic	\$125
Cbasic User's Guide	\$21
CP/M 2.2 Intel Standard	\$160
CP/M User's Guide	\$20
Despool print spooler	\$70
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WordStar Made Easy Book	\$15
SpellStar	\$199
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Super Sort I	\$199
Super Sort II	\$160
Word Master	\$120

PRINTERS

8510 Parallel matrix	\$850
Serial	\$950
1550 Parallel matrix	\$1175
Serial	\$1275
F10 Parallel daisy	\$1750
Serial	\$1975



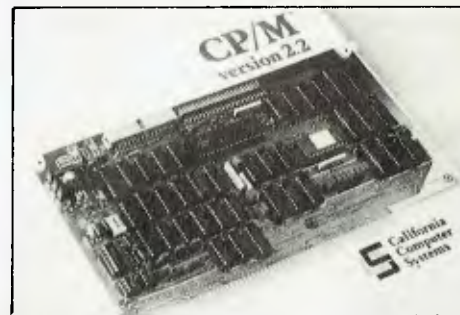
Model 2065 64K Dynamic RAM Module

The 2065 provides your S-100 system with 64K of fast, reliable memory. Compatible with the IEEE proposed standards for the S-100 bus, the 2065 features the popular 4116-type dynamic RAMs, requires no Wait states when used with a 4 MHz CPU, and supports most front panels.

The 2065 is designed for memory expansion. Using a bank port/bank byte system compatible with Cromemco and others, it can be assigned to any of eight levels of 64K, allowing system memory expansion up to 512K. To provide flexibility in memory use, any 16K block can be easily disabled or made independent of the bank-select system so that it is enabled whenever addressed. In addition, all 64K can be bank-enabled on system power-on or reset. A PHANTOM line allows memory overlay on a byte-by-byte basis.

For reliable memory, the 2065 provides processor-transparent refreshes with either the 8080 or Z-80 and incorporates circuitry which ensures refreshes during DMA and extended Wait states.

\$325



Model 2422 Floppy Disk Controller

The Model 2422 Floppy Disk Controller provides your S-100 system with a highly versatile disk controller that supports up to four drives in any combination of 5 1/4" and 8" single- or double-sided drives, reads and writes soft-sectored diskettes formatted to the IBM standards for single- and double-density diskettes, and comes fully supported with ROM-resident firmware and a copy of CP/M 2.2 on disk.

To increase its versatility, the 2422 incorporates a number of user options. For users with time-sharing systems, the 2422 implements the bank-select system used by Cromemco and other manufacturers. You can hardware-assign the board to one of eight banks, activating a bank by writing a bank-select byte to port 40h. For increased flexibility, you can make the board bank-enabled permanently or on system power-on and reset. Two type Wait requests are also available to the 2422 user. The software-enabled Auto Waits place the CPU in a Wait state if either the data register or one of the board's status registers is addressed when the 2422 is not ready for data transfer. You choose which register the CPU waits on. The hardware-enabled ROM Wait allows you to force the CPU into one Wait state per cycle in which the ROM is selected.

Other user options allow you to hardware- or software-enable fast seeks or to use any of the S-100 interrupt lines, including the vectored

\$430

Prices and specifications are subject to change without notice and do not include sales tax.

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The Eagle Lands

THE EAGLE, a "species of computer packages designed to provide simple answers to modern small business problems," was launched in Sydney last month.

The range includes five computers of varying storage capacity, matched with a comprehensive range of business software.

The hardware is manufactured by Eagle Computer, a subsidiary of Audio Visual Laboratories — the leading manufacturers of audio visual programming computers in the United States.

The software package includes the Spellbinder word processor and Accounting

Plus, a fully integrated, menu-driven suite of programs including general ledger, accounts receivable, accounts payable, purchase order entry, sales order entry, point of sale and inventory.

Thirty-two pre-programmed special function keys on the Eagle mean the word processing package offers simple, single-stroke commands, together with a Help key if the user needs guidance.

The hardware utilises the Z80A, has 64K of internal memory, a single multi-layered board and is in one case. The only difference between the computers is

storage capacity and, of course, price.

Eagle I (\$5995) has a single-sided double-density drive with 390K of formatted storage; the package includes Spellbinder word processing.

Eagle II (\$6995) has two single-sided double-density drives with total of 780K of formatted storage. Its package includes Spellbinder and Accounting Plus.

Eagle III (\$995) has two double-sided double-density drives with a total of 1.6 megabytes of formatted storage. It also comes with Spellbinder and Accounting Plus.

There are two hard-disk versions. Eagle IV (\$10,995) with 7.5 megabytes, and Eagle V (\$11,995) which has 15 megabytes.

For further information contact the distributor, Scemo, on (02) 438-3032.

Apple File Access

A SOPHISTICATED multi-keyed file access program that saves costly software development time has been announced by Apple Computer.

Record Processing Services (RPS), designed for Apple III Pascal software developers, provides file management services for programs handling large quantities of data. The multi-key file access method allows

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files to be readily interchanged among programs built on RPS. Data is not locked up in any one program.

"RPS offers to Apple III Pascal programmers the opportunity to save development time," said Kris Olson, Apple product manager.

"It is a major new product for the Apple III — a sophisticated, general purpose file access method. Apple is committed to RPS as its own Apple III access standard, and we expect it to be an important tool for software developers."

Users of RPS must obtain a license for resale or distribution of RPS-based products. Available through Apple Vendor Support, licenses are \$100 per product per year for an unlimited number

of resale or distributed copies. Technical support is available to licensed vendors.

MicroBee Deluxe

THE MicroBee computer, originally sold only in kit form, is now available as a fully built and tested unit in a deluxe new custom-made case.

And the price of the MicroBee is staying at its kit price of only \$399 for a 16K model — fully built and tested.

Stocks of the new MicroBee were expected to be available from August 1; and to those who expected it sooner after seeing the advertisement last issue, we apologise. We mistakenly placed the ad a month early.

Top 30 Apple Programs — July 1982

		Position last month
1	Choplifter	Broderbund *
2	Screenwriter II	Online *
3	Apple Mechanic	Beagle Bros *
4	Wizardry Scenario 2	Sir Tech *
5	Star Blaster	Piccadilly *
6	Utility City	Beagle Bros 7
7	Visicalc	Visicorp 5
8	VC Expand	Saturn 10
9	Ultima	CPC —
10	DB Master	Stoneware 18
11	DOS Boss	Beagle Bros 22
12	Wizardry	Sir Tech 8
13	Graphics Magician	Penguin 3
14	Apple Cillin	XPS 6
15	Escape From Rungistan	Sirius 2
16	PFS	Software Pub. 11
17	PFS Report	Software Pub. 14
18	Snack Attack	Datamost 21
19	Master Type	Lightning 13
20	Castle Wolfenstein	Muse —
21	Versaform II	Applied S'ware 16
22	The General Manager	Online 9
23	Visitrend/Plot	Visicorp 27
24	Flywars	Sirius —
25	DB Master Utilities	Stoneware —
26	Visischedule	Visicorp 26
27	Flight Simulator	Sub-Logic —
28	Sargon II	Hayden 17
29	Alpha Plot	Beagle Bros 15
30	Olympic Decathlon	Microsoft 29

*Denotes New Program
List compiled by Imaginering.

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With easy to follow installation instructions.

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Provides single/DOUBLE density operation thus doubles disk storage and halves 1/0 times. \$185.00.

(*) DISK ERROR ELIMINATOR

For error free disk operations, a must for the TRS-80. \$34.50

SPEED MOD V2.0

Runs programs up to double normal speed. perfect for halving sort times, etc. Ideal with ANY operating system. \$99.50.

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Essential for word processing use, full L/C descenders and NO SOFTWARE DRIVER REQUIRED. \$59.50.

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 2. Unpredictable "REBOOTING" of disks.
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Computerised Slide-Show

THE FIRST microprocessor-controlled soundslide projector that can interface with a microcomputer and be programmed to run slides in any

sequence regardless of their tray order has been introduced by Bell & Howell Australia.

These start-of-the-art developments are incorporated into the top-of-the-line model of the new RM 800 series soundslide projectors which will help meet the widening communications needs of business, education and industry.

"Since the introduction of soundslide projectors in the early 1970s, few major product developments have occurred until now," says John Swainston, the company's divisional group general manager.

The microcomputer interface capacity allows the 850 to be used as a peripheral with all major microcomputer systems. With the wide variety of microcomputer software, the projector can be-

come a tool for interactive learning.

The 850 with its computer technology is one of a family of four models in the RM 800 series combining advanced micro-electronics with a range of sound and projection feature innovations.

For further information contact Bell & Howell Australia at GPO Box 4778, Sydney 2001.

Apple III CP/M

THE Apple III personal computer will now run CP/M-based application programs with the introduction of the Apple Softcard III System.

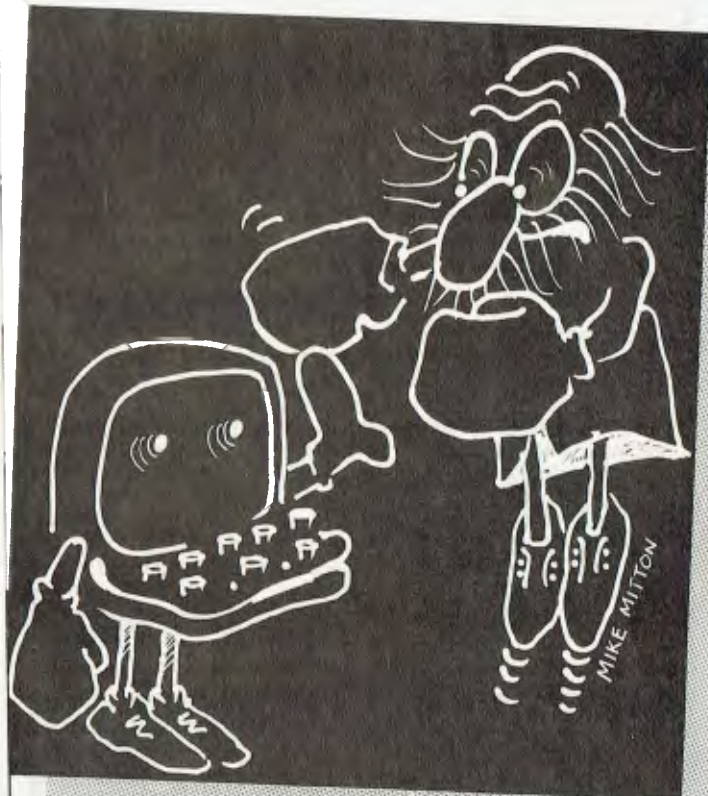
The Apple Softcard III System was developed by Microsoft Corporation and is being distributed exclusively by Apple Computer. Microsoft also developed the Softcard System for the Apple II and Apple II Plus computers.

"The Apple Softcard III System brings dual-processor capabilities to Apple users," states David Escoffery, Apple III product marketing manager.

"The range and variety of programs compatible with these two operating systems makes the Apple III an enormously flexible computer for business, science, industry, and education."

A major feature of the system is that it supports the Apple 5-megabyte mass storage system, Profile (TM). Both SOS and CP/M files can be stored on Profile.

The Apple Softcard III System includes a plug-in Z80 microprocessor card, CP/M software, and four manuals which describe card installation and use of the software. The system also provides Microsoft BASIC.



Whose side is yours on?

If you have been put off 'going computer' because of the possible problems you have heard about, you're overlooking something.

Quality software provides the 'detente' between man and machine.

Before you end up in the ring with a computer, see a demonstration of the Six 'S' Business Pack.

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I.B.M., Digital and other industry giants have gone the CP/M way!

YOU CAN TOO WITH THE BRILLIANT SORCERER!

Some of the world's leading computer manufacturers are now producing CP/M based systems to utilise the vast range of existing software. The only problems for you are 1) Some of the CP/M-based systems are not yet available in Australia, and 2) Some of them may cost up to, and over, \$5,000! So why not check out ...

The Incredible Sorcerer

For the serious personal computer user, it offers a truly outstanding performance - plus the ability to run the industry-standard CP/M operating system at lower cost than any other computer. The Exidy Sorcerer MkII — the most powerful, flexible and businesslike machine in its class.

Look at the features

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- Expandable to 48K on board
- Uniquely versatile ROMPACS™ — instant change to dedicated processor, and back again!
- Built-in 4K ROM resident monitor
- Economic disk storage now available (optional) with Exidy's FDS — floppy disk subsystem (does not need expansion interface)
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Cat X-3002

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When you purchase a Sorcerer Computer, VIC 20 or System 80 from Dick Smith Electronics you become eligible to win a **DATSUN STANZA GL four door sedan!**

Don't delay, hurry in for your computer now! Contest must close soon!

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DSE/A236M/PAI

Intelligent Case

THE FIRST two products in a new range of intelligent matrix printers have been released by CASE Communication Systems.

Manufactured specifically for CASE in the UK, the initial range constitutes the BD 136 with 240 cps capability and the WM 2000 with a speed of 120 cps.

Both printers offer a bi-directional logic seeking mechanism for maximum throughput speed and to minimise printhead movement.

A 9 by 9 dot matrix provides high quality print and the ballistic printhead has proven to give reliable, long-life according to CASE.

Both units include dot addressable and character graphics as well as user programmable characters. The BD 136 has an alternative 96 character set, user-

defineable and capable of printing with a resolution of 60 dots per inch horizontally and 72 per inch vertically.

Interfaces available with both models include Centronics parallel, RS 232, Current Loop and IEEE.

For further information contact CASE Communications Systems on (02) 438-2400.

IMS For ICL

LOCAL business software house Integrity Management Services' products are to be offered with the ICL personal computer range.

The IMS Advanced Business Software (Version 3.3) will be offered through ICL dealers in Australia, New Zealand, Hong Kong, Singapore, Malaysia and the Pacific.

Olivetti has also settled on IMS Business software packages to go with its new

M20 series of desktop computers.

IMS managing director Bryan Gardiner said his software would also be available to American users through the IMS subsidiary, American Integrity Systems.

"Our integrated business software packages are already the top seller in Au-

stralia, and this agreement with ICL is a flattering endorsement of Australian software by a major computer house," said Mr Gardiner.

The IMS package includes stock control, accounts receivable, accounts payable and general ledger, all of which can be run separately or as a fully integrated suite.



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PUBLIC DISCLAIMER OF WARRANTY — After unauthorised conversion.

The distributors of Atari 400 and 800 model Home Computers warn owners that they should NOT convert their computers with 48K RAM or 32K RAM boards or similar programs. These call for functions for which the Atari units were not designed.

Unauthorised conversion is not recommended by Atari and owners should be warned that the manufacturer's warranty on their computer may be jeopardised if any damage should occur.

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VIC-20 COLOUR COMPUTER

Ideal for the first time user, this remarkable computer can be used immediately with plug in cartridges. The fantastic range of game cartridges can be used with any colour or B & W TV set, to look just like the arcade games. Or it can be expanded to form the heart of a complex computer system. The system is programmed in BASIC and ".....provides good value for money....." (EA, July 82 Pp 114)

Also available:

Colour monitor to suit VIC 20, Cat X-1195 \$379.00
B & W Monitor to suit VIC 20, Cat X-1196 \$149.50

GENUINE VIC 20 PERIPHERALS



ONLY
\$399

Cat X-2000



Store your programs DATASETTE

only
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This remarkable computer comes equipped with a tape cassette interface which lets you connect the Commodore tape unit directly into the computer. With this ability you can load, store or retrieve data on standard cassette tape. By a simple command the machine will automatically 'save' a full program for you. It's a handy and economical way of storing and retrieving data, plus you can buy existing software or create your own programs and store them. Cat X-2005.



MEMORY MOTHERBOARD

Now you can connect up to 6 different expansion programs at the same time. Increase your computer's capabilities to its maximum of 32K plus connect interface cartridges as well. Cat X-2011

ONLY
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Fast, high capacity storage/retrieval of data on standard 5.25" floppy diskettes. Stores up to 170K on each diskette, with read/write compatibility with PET/CBM Computer Systems. Comes complete with own power supply. Cat X-2007



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Economical dot matrix printer makes paper copies of BASIC programs, letters, business data and graphic displays. Connects directly to the VIC 20, prints all characters incl. letters, numbers and graphics. Reliable tractor feed mechanism. Accepts sprocketed 8 inch roll or sheet paper. Unique uni-hammer print head for improved reliability. Cat X-2009

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Introduction to Computing

Sample programs in the book and on tape make this an interesting introduction for the non-computerist. Cat B-2001

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Introduction to Basic

A gentle but thorough introduction to BASIC programming. Instructional tapes are supplied. Cat B-2002

\$29.95

Personal Computing on the VIC 20

The 'friendliest' computer guide available. This manual comes free with every VIC 20 but is also for sale separately due to the high demand. Cat B-2003

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Allows 4 way movement. Play against the computer as in the popular arcade type game 'Space Invaders'. Cat X-2020

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Superslot

Colourful slot machine, works just like the real thing! Cat X-2049

\$39.95

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Authentic night drive simulation provides chills and spills? An unusual computer challenge.

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Jelly Monsters

Jelly Monsters abound in a maze, racing at you, following your every move. Look out!

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Pilot your Jupiter Lander through the treacherous crevices of a mysterious planet.

Cat X-2052 **\$39.95**

ON CASSETTE

Car Chase

Fast paced road action

Cat X-2031 **\$14.00**

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Casino style blackjack

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Biorythm

Compare biorythm compatibility

Cat X-2034 **\$14.00**

Slither/Super Slither

Dexterity game.

Cat X-2036 **\$14.00**

Blue Meanies

Space game. Watch out, they'll get you!

Cat X-2033 **\$14.00**

Space Math

Maths improvement. Learn at home!

Cat X-2035 **\$14.00**

Recreation Pack

Contains all of the above cassette programs in a six pack. Cat X-2037.

\$75.00

Programmable Character Set

Lets the VIC user create up to 64 programmable characters, and use them in BASIC programs. The Editor takes only one half kilo-byte of program space, works with tape, disk and printer.

Cat X-2045 **\$29.95**

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DSE-A313/3/PAI

A.C.S. — A Classy School

A new school in Sydney claims to be 'taking the mystery out of computers' for today's businessman — people who know they need computers, but have never used, or even seen, one before. We put it to the test by sending along the glossy brochure's 'model' student.

Greg Hawkins had never touched a computer before his was delivered, the week of the course. He wanted to use it to keep track of his expanding chain of Warlords' Cavern home video stores, but didn't know where to start.

He arrived at the course a total novice, full of questions about how to get 'the machine' to do something for him. He left with enough answers to justify the visit — and his computer purchase.



IT'S 8 am sharp, at Applied Computer Sciences, and here I am wondering exactly what am I doing in the midst of all these computer people — I can hardly figure out how to turn on my machine!

Look out, someone's coming and he's heading straight for me. He introduces himself as John Meehan and takes me along to meet everyone else.

There's another independent businessman like myself, a general manager of a large company, a young data processor from an insurance firm, a marketing man from a chemical company and others. It seems we all have one thing in common — we don't know a thing about BASIC, but we'd all like to.

Well, that's a relief. I thought I was going to be the odd one out. One hurdle out of the way...

We have an informal chat and coffee and I think to myself this isn't all that bad; then it happens...it's time to start.

This is what I've been dreading, the practical work. Why? Because I would have to be the slowest, most fumble fingered typist I know.

There's no way I'll be able to keep up. But what's this? We all have our own machine, our own disk, with our own exercises and I don't have to worry about anyone else except myself. No-one even knows how fast or slow I'm going.

Hey! This might not be so bad after all! And this exercise disk is great! It's a step by step guide that I can just follow and type in as I go along. I can even tell it when I am ready to continue. Great!

I've been merrily typing away here for about 20 minutes and you wouldn't want to know I've already written my first program. Sure it's not very big (4 lines to be exact) but it's a start.

Luckily John Meehan and his offsideer Marilyn Cross are always about to lend a hand and they aren't even surprised at all the mistakes I'm making — as a matter of fact they've been waiting for me to make them, it seems that just about everyone does.

Lunch comes and goes (beautiful restaurant and food and company) and then we're back into it.

The amazing thing is that all those GOTOs, GOSUBs, C1\$s and so on aren't just printing mistakes, they actually mean something...and everything starts to fall into place.

By the end of the second day I've worked on arrays, created files, learned the if-then, for-next routines and all sorts of goodies with the help of John and Marilyn and all of a sudden I realise computer is a tool for me to use, not worship.

The course, with its hands on, practical experience has shown me what a power-

ful piece of equipment my computer can be.

So if you feel you aren't getting the true benefit from your computer, or if you've felt that none of the courses around are for real beginners, or even if you feel you would like to expand your current knowledge, then get over and enroll yourself in this course.

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Spectrum Analysis

By Graham Webber



DID YOU ever try to buy a new micro off specs? Not easy, is it!

Lots of people have written seemingly knowledgeable reports about Sinclair's new machine, the ZX Spectrum, but close inspection leads a person to believe that many of these 'reports' are simply re-hashes of Sinclair-produced press releases and advertising blurb.

Not that there's anything wrong with press releases, it's just that manufacturers are prepared to crow about what a machine will do, but are understandably reluctant to divulge just what a machine will not do.

With this in mind, I'd held off buying a new Spectrum from England until I'd had an opportunity to either try a machine or read a report written by a Spectrum user. After all I wasn't feeling inclined to part with a large wad of hard earned Oz dollars simply on the recommendations of some anonymous advertising executive.

Please forgive, me Uncle Clive, I owe you an apology — your machine seems to be everything you promised. I've tried it myself, and I love it.

Realising that an imminent trip to the UK was a golden opportunity for a hands-on demonstration of the new machine, I set about trying to find a Spectrum owner

located near where I was planning to stay.

Word soon came back to Australia that there was a user only three doors down the road, and that arrangements had been made for me to try the machine myself.

A couple of raps on the door, combined with a doleful expression and just a touch of the old silver tongue soon had the owner and myself perched in front of the colour teevee. Thanks for the demo, Jane, and please thank your folks for agreeing to watch the World Cup on the old black and white portable...

The computer itself is known in England as the Sinclair ZX Spectrum. It's very unlikely that it will sport this label for the Australian market.

The basic machine has 16K bytes of RAM and 16K bytes of ROM. Features include single word entry, colour graphics, sound and automatic syntax checking. It measures approximately 22cm by 12cm by 2.5cm, and weighs in at around half a kilogram.

The Price Is Right

Cost in England is £125 (\$230) for the 16K version. A 48K version is available for £175 (\$320). Owners of the 16K machines who would like to upgrade to

48K can do so by sending the whole kit back to Sinclair along with a cheque for a further £50 (\$90).

Sinclair also tempts us with a 100K byte micro-floppy to be released at a later date, and an RS232/NETWORK interface board which will allow you to connect the Spectrum to a whole range of commercially available printers. You would also be able to connect a few machines to each other as well.

Apparently up to eight micro-floppies can be used, making the machine very powerful indeed. Cost of the micro-floppy will be about £100 (\$180) and the interface board £20 (\$36).

The prices look terrific, don't they? However, don't be surprised if the machine ends up costing a whole lot more in Australia.

At present a ZX81 with 16K RAM costs £99.90 (\$181.63) in England and \$349.00 in Australia. This is a massive 92 percent increase on the English retail price. I say massive (unjustified?) because the duty on the machine is only six percent of the wholesale price.

If pricing of the new machine is based on the same formula — and who's to say it won't be — the basic Spectrum will cost around \$450 and the 48K about \$600!

Hopefully the Sinclair agents will be willing to deny this assumption because if they don't I can predict an awful lot of VIC-20s being sold to people who were willing to wait for a Spectrum.

I am however diverging from the main theme, which was supposed to be a 'hands-on' evaluation of the new colour machine.

The very first thing I wanted to compare between the ZX81 and the Spectrum was — you guessed it — the keyboard. Well, it's much better. They both have forty keys but the Spectrum keys are almost real.

I say almost because, although the Spectrum dabs are a huge improvement on the '81, they still don't feel right. An Olivetti it will never be...more like calculator keys than anything. Still, beggars can't be choosers, and since I'm still a beggar, I'll be more than satisfied with what Clive has made available this time around.

A Bit Of A Squeeze

The main problem has to do with all the functions, symbols and letters squashed into such a tiny space. If you once had a problem sorting out the old '81 keyboard, you can expect to be in heaps of trouble with the Spectrum.

Not only are you asked to locate one of nearly two hundred different symbols on the board, you may also be required on occasions to depress three keys at once! Spare set of fingers, anyone?

To be fair, though, the layout is quite logical and quite a lot of thought must have gone into the ergonomic design. For example, THEN and GOTO are on the same key, and LET and '=' share the same key. You still won't enjoy the benefit of a space bar, but at least the space key is bigger than the rest.

Although we pay the penalty of a cluttered keyboard, there is one very important advantage to having single key entry. You will never have to search through the manuals to determine how a particular keyword or function is spelt. If it's not right there in front of you on the keyboard, it doesn't exist in Sinclair BASIC. This system also saves on memory, because each BASIC word takes up only one byte.

A further difference between the two machines is the click that is produced each time a key is depressed. By poking a particular location you can change the click to a more distinctive beep. Also, each key has auto repeat, which is a real godsend when editing long program lines.

Here I found a huge improvement. Of the twenty or so programs that I loaded, only one failed, and that was because I'd screwed the player's volume up to maximum. Apparently, when a program is transferred to tape, the machine produces some sort of tone burst to set the auto record level found on most modern re-

corders. I also read somewhere that the computer also incorporates a Schmitt trigger arrangement in the playback mode to remove unwanted tape noise.

For example, when I loaded my first tape I was pleasantly surprised to find the screen telling me I was loading a program called 'X'. The name 'X' is determined by the REM statement at the beginning of the program. Fascinating!

I also discovered I can save parts of programs, data and variables, which I couldn't do on the '81. As well as this, there is a facility to save a screen picture without having to save the program that was used to create the picture. All very good stuff.

End Of The Cold Sweat

Have you ever wondered whether or not your precious program has been SAVED correctly on the '81? Do you break out in a cold sweat just before you pull the plug? Well, you won't with the Spectrum because the machine has a VERIFY feature.

Once you've saved your program on tape, you play it back before clearing the memory, and the machine compares what comes back with what's in memory and verifies that the program has been saved correctly. An extremely useful and necessary feature.

Unfortunately, the machine still isn't able to tell the recorder when to turn itself on and off. You still have to do it manually. I guess that isn't going to bother us much once we've connected up the micro-floppies.

Finally, the Spectrum saves and loads programs more quickly than the '81. This means shorter waiting time and more programs to a cassette.

Spectrum BASIC and ZX81 BASIC are much the same. Naturally, with 16K bytes of ROM on board there are going to be some differences, but these are mainly in the form of additions rather than changes.

The main change is the adoption of the ASCII upper and lower case character set, which because of the different character codes, is the main reason the ZX81 program cassettes won't work on the Spectrum.

However, once you type the '81 listing into the computer, they'll save and work in exactly the same way as before, providing that you take care to change any PEEK, POKE and CODE instructions to suit the Spectrum's requirements.

The additional BASIC commands that are not associated with the sound, colour graphics or micro-floppies include DATA, READ, RESTORE, DEF FN and CLEAR. DATA allows you to provide a list of statements at the beginning of a program and READ asks the machine to read the statements one at a time. RESTORE is used to reset the data pointer at any particular point in order to start again. Quite an im-

provement here, because it was necessary to hide data in a REM statement on the '81.

DEF FN is another useful addition. It allows us to define a new BASIC instruction and to say what it is supposed to do. Unfortunately, I wasn't able to try it out because I didn't have enough time to find out how it worked.

The days of having to slot machine code into a REM statement are also over. By using the new CLEAR command followed by the appropriate address you can move RAMTOP to that address, and use the area left for machine code. Far easier to handle.

Ready For Disks

The commands concerning the micro-disk feature include CAT, CLOSE, DELETE, ERASE, FORMAT and MOVE. It beats me how they work.

Up to this point what I've really been describing is a sort of beefed-up ZX81. So when does a Spectrum become a Spectrum? When you add colour graphics, of course.

The colour graphics are beaut. The colour shimmers and wobbles but it's still beaut. When the machine is first turned on, the display appears as a white square inside a white border with black characters — just like the ZX81, but instead of a K in the bottom left hand corner the machine actually introduces itself. What will they think of next?

In order to get some colour up, you have to tell the machine what you would like to see. To do this you need to use three commands, BORDER, PAPER and INK.

The machine is capable of producing eight different colours with two levels of intensity. Each shade is identified by a number between 0 and 7. The colours available are black (0), blue (1), red (2), magenta (3), green (4), cyan (5), yellow (6), and white (7).

BORDER refers to the area extending from the edge of the screen to the edge of the PAPER upon which the graphics are printed in INK. Simple, eh! The commands BORDER 2, PAPER 6, INK 1, will produce a display incorporating a yellow background surrounded by a red border. The characters appearing on the background will be blue.

You can even put a red border around a red background by using the BRIGHT command. I tried it but I'm afraid I could only just see the difference.

Other commands include FLASH, INVERSE, OVER, DRAW and CIRCLE. FLASH is self explanatory. INVERSE swaps the colours of the paper and the ink. This affects the whole character matrix, so has a blotchy effect. Far more useful is the OVER command, which allows you to merge a character over a character.

If you print a flashing character OVER a

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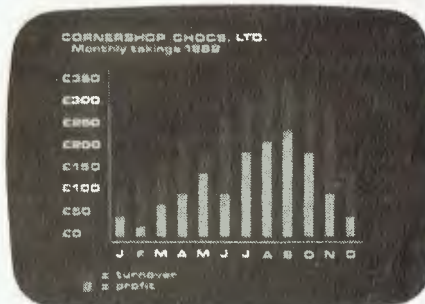


solid block of colour, you can get a flashing label effect. Also, if you print a double quote over an O you end up with an Um-laut — terrific if you happen to read German. Experimenting with the OVER command using the RND function gave some very interesting combinations, some of which I would have wanted to save for use in games programs.

Easy-Draw

Care to draw a straight line? Easy. Just use the DRAW command along with a starting and finishing point and it appears as if by magic. Draw an arc using the same command after adding a third argument expressed as a fraction of pi. Same goes for the CIRCLE command. Give it a centre point and a radius and the circle will appear...sort of! It's a little 'steppy'.

A further useful addition is the BIN com-



mand. Very useful for defining your own graphics. Each character is made up of ink spots within an eight by eight matrix. Use the BIN command to fill each of the 64 squares with a 0 or 1. The '1's represent the ink spots.

I found it great fun to use, and within a short time I was quite adept at producing very respectable space invaders characters and chess pieces. Makes for very realistic arcade type games.

The facility to produce LISTings of various colours is also available. This means that your main program listing can be in black, and sub routines could be red. You may even want to add flashing REM statements. The possibilities are endless.

I've left the sound feature till last. Probably because I find it rather disappointing. Should it be required, the machine is able to produce a very quiet beep in response to the BEEP command. The basic note is a middle C, and duration can be set in seconds or parts of seconds. The pitch can also be set higher or lower by setting the number of sonic tones wanted above or below base frequency.

The sound can be improved by connecting an amplifier to the cassette port, but then you have to keep on disconnecting every time you want to SAVE a program. Besides — who wants to carry an amplifier around with them? A further problem associated with BEEP is that the micro stops working while the sound is being produced. This tends to reduce fast games programs incorporating sound to a slow crawl. Not very good.



Generally, the ZX Spectrum seems to be terrific value for money (in the UK). How it shapes up here in Australia will depend a great deal on the price. It's still got some of the old ZX81 problems, such as the keyboard clatter and funny BASIC, but I can soon live with that.

The machine is slower than a ZX81 in fast mode, but the colour graphics more than make up for the speed. The extended Sinclair BASIC adds a lot of good features and I think the machine is friendlier.

Once the micro-drives and printer boards are available, the computer will be streets ahead of the others. I've already ordered mine from overseas, and I can't wait for it to arrive. □





OKI's OK Oriental

Oki is one of those extremely diverse Japanese companies which manufactures everything from integrated circuits to printers. Its latest product to hit the stores in Australia is the Oki if-800 personal computer.

AS THE IMPORTANCE of colour graphics displays begins to filter through to commercial users, a number of machines are beginning to appear which capitalise on this feature to add an extra distinguishing ability to a standard business computer. The presence of colour graphics ability in the IBM and similar computers is not for game-playing.

The latest machine in this class to appear in Australia is the if-800, manufactured by Oki. This is a rather interesting machine from a number of viewpoints.

your computer



First, it is a big box — bigger than most of the 'mass-market' personal computers such as Apple and Tandy. Second, it contains a built-in printer which can be used to dump the screen to hard copy, or just as a general printer.

Third, it offers high-resolution colour graphics of an extremely high standard, with 640 by 200 resolution and eight colours. A matching colour display with integrated disk drives, which sits above the computer, offers an immaculate colour image, with strong colour saturation that produces a most attractive display.

The graphics capabilities of the machine are positively seductive, as this month's cover photograph (produced on the Oki) shows.

The Oki is a large machine (in its fully expanded form). The main box containing the processor, keyboard and printer butts up to and sits under a high quality colour display with integrated disk drives and programmable keys.

Quality Construction

The construction is of very high quality, largely of pressed metal and some plastic trim and mouldings, and gives the

impression of considerable robustness. In other words, the machine can stand up to the kind of long hours and pounding it would receive in a typical (busy) office.

Inside the machine, the quality of construction continues. The main processor board sits in the bottom of the machine, and mounted above it, on clips for easy servicing, is the keyboard. To the rear left is an eighty-column printer mechanism, while at the right is a card cage for further expansion. In the model we reviewed, two slots were occupied by the disk controller card and a colour graphics RAM card.

The keyboard is nothing if not comprehensive. There is a full QWERTY keyboard, numeric keypad, cursor control keys and miscellaneous functions such as tab set, clear screen, and so on.

Across the top is a row of 10 programmable function keys. As well as the control key, there is also a 'command' key which allows access to a second set of super-shifted functions, and a 'Kana' key which allows access to a set of Japanese Katakana characters (in Oki-BASIC) or functions as a caps lock under CP/M.

The keyboard is an interrupt-driven processor scanning type, which allows it to be completely reprogrammed under software control. This means that one cannot really describe the operation of the keyboard, as it can completely change under different software subsystems. For example, under WordStar, the various dedicated function keys like 'INSERT' can be reprogrammed to perform the corresponding WordStar function.

A couple of other notes on the keyboard: the keys do not have as much travel as most other keyboards, so that at first it feels a little strange; and second, the computer beeps to give audio feedback that a character has been accepted. Since the keyboard is interrupt driven, it can continue to accept characters while another process executes (except during disk read/writes), although the characters will not be displayed immedi-

ately. For this reason, the audio feedback is useful (it can be disabled if required).

At the front right, below the keyboard, is a ROM cartridge socket. To be honest, we can't see many people using this feature, as the system has plenty of RAM and boots off disk anyway. However, the machine is available without disk drives or display, in which case it uses a cassette interface, and in those circumstances a ROM cartridge would be useful.

Also inside the main box is an 80-column dot matrix printer. Ironically, for a company which is well known for its printers, this is the weak point of the computer. While the printer is probably adequate for program development and perhaps some reports, it is not really adequate for much business use.

The most outstanding flaw is the lack of descenders on lower case characters (p, q, y and so on). While this could perhaps be rectified by redefining the character set in software, none of the software we examined did this, and it may not be as easy as one might expect. Furthermore, the printer uses pin feed (not tractor), making adjustment for different paper widths difficult, and was rather awkward to feed roll paper into.

In-Built Advantages

On the other hand, having the printer built into the machine does have some advantages. It is possible to dump the contents of the screen to paper at the push of a button — including graphics. The printer can be enabled/disabled at will, allowing a selective record to be kept of transactions being entered.

Of course, there is nothing to stop the connection of an external printer, and the RS-232C port on the side of the machine will allow anything from a simple dot matrix printer to a daisy-wheel. Incidentally, the machine knows about XON/XOFF protocol.

The machine is based on the ubiquitous Z-80 processor, running at just under 4 MHz, and has 64K of RAM as standard,

Japan Prepares For Battle

A SEEMINGLY harmless aspect of the Oki ii-800 — the fact that it runs Digital Research's CP/M — spells trouble for the computer technology leader, America.

Put simply, it illustrates the Japanese are waking up to their software deficiencies and are turning to America for the help they've needed.

Make no mistake, it has been this aspect alone which has held them back. Their hardware is generally excellent — both well designed and cleverly/efficiently manufactured.

'Funny' operating systems, incomplete utilities and 'cute' applications programs have been the only drawback. That is changing, fast.

A whole range of new and powerful machines is due for launch, and most will be attractive and comprehensive packages. American software, from companies like Digital Research, Microsoft, Micropro, and Ashton-Tate will abound.

The stumbling block in the past has been Digital Research's unwillingness to write the hardware-dependent CP/M BIOS — that is usually the job of the man-

ufacturer, but the Japanese just weren't up to the task. Now they are employing American consultancies (like Lifeboat Associates, which provided the CP/M for Oki) to do the job.

No longer are they relying on a Microsoft BASIC 'operating system', and hastily-prepared software packages which often did little more than prove the machine had a processor inside.

There's already a strong Japanese presence here, and it will soon skyrocket. For example, eight Japanese manufacturers are displaying their wares at Data '82 this month. New machines we may not see there, but which are on the way, include:

- **Fujitsu** (Facom) FM8, a high-performance dual-processor machine based on the 6809 chip. Fujitsu says we won't see this machine in Australia, which suggests there's probably something else just around the corner.

- **NEC** 'APC', or Advanced Personal Computer, which will be launched here shortly. It's a 16-bit machine, based on the 8086. NEC is marketing the 8-bit PC8000 here already.

- **Toshiba** will soon launch two new

models, called T200 and T300.

- **Epson** — yes, the printer company — has shown but not released the HX20. It's a compact portable, with integral display and printer, and looks good.

- **Panasonic** has already released its 'IBM-compatible' JB3000, and will soon launch the Link — a large hand-held machine which takes plug-in video displays, modems and other accessories and can be carried in a briefcase.

- **Hitachi** will have announced three new products by the time this issue reaches the news-stands. Two of these are 16-bit computers, and the third (finally) is the micro-floppy drive, which fits around 300K onto a three-inch disk.

Australia will see many of these machines before the rest of the world, as it makes a good test market. One reason for this is the fact that the Japanese home market is two years behind us — basically because of the difficulty of including the Japanese character sets in the machines.

This problem generates side-benefits — the Japanese preoccupation with high-resolution graphics is a result of their need for complex character sets. □

with an additional 48K devoted to the display. There is 2K of ROM carrying a self-test routine and bootstrap — interestingly, the system will boot from either disk drive, cassette or ROM.

The machine is quite quick. We benchmarked it using the same tests as we did on the IBM Personal Computer two months ago and it turned in a very creditable performance. The prime number benchmark ran in 2 minutes 4 seconds, while the disk test ran in 52.2 seconds (the IBM ran 1m 51s and 27s respectively).

Above the console is a colour display unit. The monitor is capable of very high resolution and impressive colour saturation. The unit's graphics capabilities encompass 640 by 200 graphics in eight colours. In text mode, a variety of display formats is possible: 80 by 20, 80 by 25, 40 by 20 and 40 by 25. The character set is generated from RAM, and so is definable by the user.

A consequence of this is that the display does not have lower case descenders; the same problem as the printer. In addition, particularly in colour, this software generation of the characters seems to slow the display down slightly. In practice, this is unlikely to affect users of the machine.

The good news is that the total software control over the display does have its benefits. For example, the display can be set for 'smooth' or 'soft' scrolling, which eliminates the jerky upwards motion which can make listings very difficult to read. Furthermore, any type of character set can be displayed on the screen, as the Japanese set adequately demonstrates.

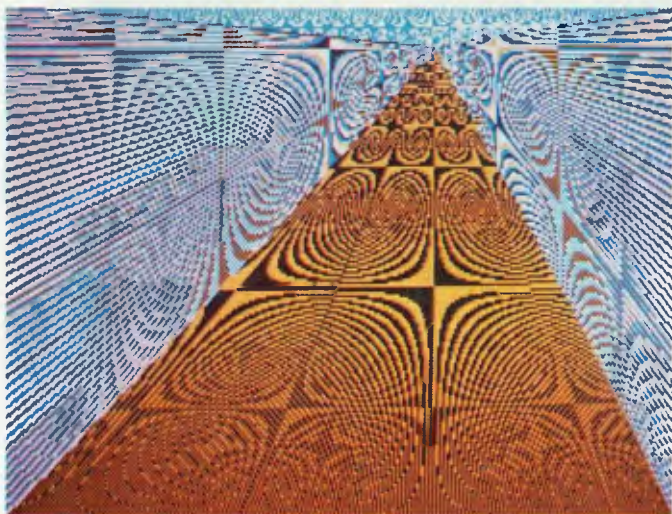
Below the display is a set of programmable keys. Under Oki BASIC, these just mirror the programmable keys on the keyboard below, but under CP/M, they can be treated separately. In particular, the 25th line of the display could be used to label the keys — a device which Oki uses in many demonstration programs.

The disk drives to the right are double-sided double-density units with a capacity of 280 Kbytes/disk under Oki BASIC or 384 Kbytes/disk under CP/M. Oki BASIC has an annoying habit of leaving the drive activity light on even when doing nothing, making it a bit difficult to know when it is safe to remove a disk.

Avoiding BASIC Pitfalls

Like most Japanese companies, Oki got itself going by having Microsoft knock up a version of its self-standing BASIC interpreter which includes all the disk I/O functions.

We're afraid it is this approach that has got so many Japanese companies into software difficulties, as they then tried to write all their system software and utilities (formats, disk copies, and so on) in BASIC and wondered why it was so incredibly bad and ran so slowly.



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Post Code: _____

Fortunately, Oki has only partially fallen into this trap. Oki BASIC is a comparatively new version of Microsoft's mix'n' match BASIC, and is in fact similar to that used on the IBM PC and Tandy's Extended Colour BASIC. That is, it contains all the standard BASIC features we've come to know and love, plus all those high-res graphics and music add-ons that make programs so interesting.

For example, the RS-232C port is supported for interrupt driven communications through a version of the OPEN statement:

```
OPEN "COM1:8N81" AS #i
```

will open port 1 for communication at 9600 baud with no parity, 8 data bits and 1 stop bit. The port is accessed as file 1.

Interrupt handling on receive is done through the ON COM GOSUB statement which will cause a branch to the appropriate routine for the port which has received a character.

Oki BASIC also includes the Graphics Macro Language found on the IBM PC. The DRAW statement takes a string as its argument, consisting of letters and numbers which control the movement of an imaginary 'pen'. For example:

```
DRAW "M320,100U20R20D20L20"
```

will draw a square of side 20 with the bottom left hand corner at the middle of the screen (320,100).

Other macro commands can specify colour, scale and rotational angle. The whole facility is very easy to use, and quite powerful.

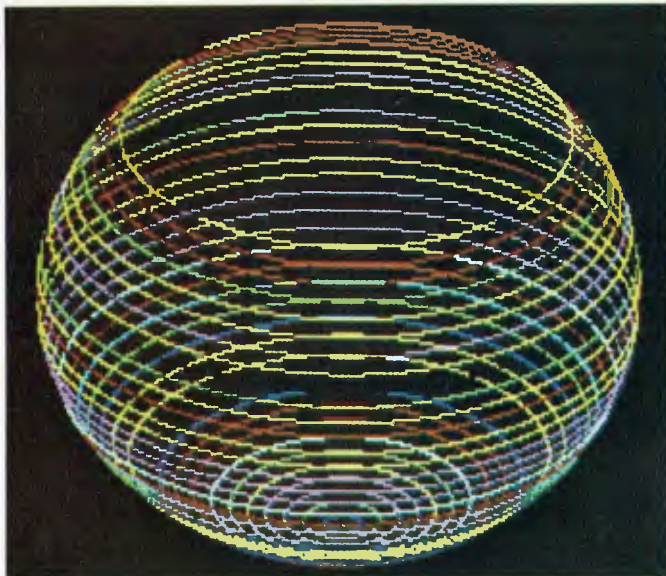
The PAINT statement will fill an area with a specified colour, moving outward from a particular point until a boundary of another, specified, boundary colour is met. This statement can be used to create some fantastic effects not possible with conventional line graphics.

The Music Maker

Also available on the machine is Music Macro Language, which operates in a similar way to the graphics facility by setting up strings of music characters.

Generally, Oki BASIC is quite powerful, and includes a number of machine-specific extensions, particularly in the graphics, music and communications areas, but the fact that it is self-standing means that it cannot be used with other packages.

The Oki also runs a Lifeboat Associates implementation of CP/M, and this offers a number of interesting features. A program called CONFIG.COM allows complete redefinition of the keyboard to strings of up to 80 characters, control of the screen



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including cursor blink rate, end-of-page wraparound, keyclicking and smooth scrolling, initial I/O assignments, serial port characteristics, printer parameters and other functions.

Using this program, the hardware characteristics of the machine can be almost completely altered.

Other utilities allowed use of a light pen for drawing on the screen, setting and displaying the real-time clock, and memory testing. There is also a dumb terminal program which operates through the built-in RS-232C interface.

The screen emulates an 'enhanced' ADM-3 terminal under CP/M. This makes it a snap to install software such as WordStar and Supercalc, and is something that other Japanese manufacturers do not seem to realise the importance of. Extensions allow escape sequences to set the colour, print the screen and other functions.

Our test system included a demonstration copy of WordStar installed for two-colour operation. The use of two colours made it particularly easy to distinguish WordStar's menus and messages from the text being edited. One problem arose with the internal printer's knowledge of page lengths conflicting with WordStar's: the printer would automatically form-feed every page, as well as accepting WordStar's sequence of line feeds to do the same thing. The result was a shambles!

Plenty Of Software

In addition, a wide range of software is available to run under CP/M. This includes database managers such as dBASE II and FMS-80 (which we were able to see in operation), languages such as Pascal, PL/1, BASIC compiler, FORTRAN and others, and the well-known Micropro range of WordStar, SpellStar, DataStar, CalcStar and Supersort.

Optional accessories for the if-800 include 20cm disks, a light pen, Centronics, RS-232C and IEEE-488 interface cards, and A/D and D/A cards.

The demonstration programs we saw on the if-800 showed a number of interesting applications, including graphing and plotting, time scheduling, computer art and game playing. Some of the graphics in particular are very impressive, and there is no doubt that there is a lot of potential for this machine in 'serious' business use of colour graphics.

Summing up, the Oki if-800 is a very interesting computer indeed. It is powerful, featuring an excellent extended BASIC as well as the ability to run CP/M and its wide range of software. Its fantastic graphics capability will attract many users. It is well engineered and represents good value for money. □



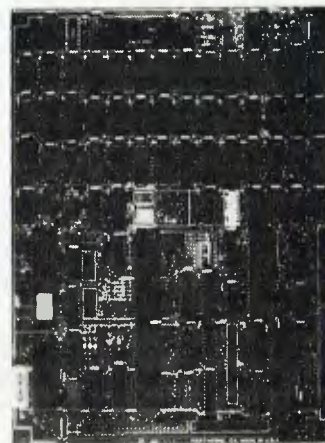
Specifications and Report Card

Unit:	Oki if-800
Made By:	Oki Electric Co, Japan
Processor:	Z-80A
Clock Speed:	4 MHz
RAM:	64 Kbytes
ROM:	2K bootstrap and self-test
I/O:	Integral screen, keyboard and printer RS-232
Languages:	Microsoft BASIC, plus the CP/M range
Keyboard:	QWERTY, software definable, plus function keys
Display:	80 x 25 colour
Graphics:	640 x 200
Peripherals:	Who needs peripherals
Expansion:	Internal bus, RS-232C, disks
Best Points:	Graphics are stunning
Worst Points:	Printer is the weak point
Ratings:	excellent very good good poor
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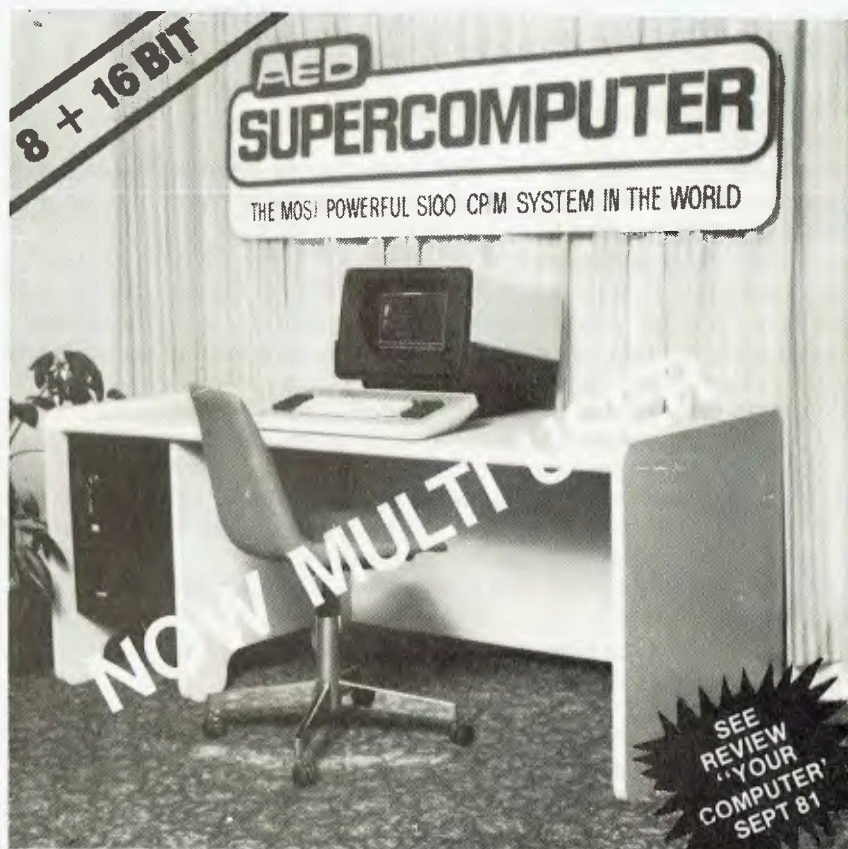
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Applegaming Action

By **Imagined** Sandys

I'VE BEEN having fun with several new games lately, even if my boss is starting to question the value of the time I spend on research.

The problem is there are so many new products coming up all the time — he'll just have to understand that informing *Your Computer* readers comes first.

The first one I looked at is *Swashbuckler*, from Datamost. *Swashbuckler* is a fun game in which you, the swordsman, are constantly being attacked by pirates, rogues, snakes, scorpions, spiders and rats.

The game uses the keyboard. Keys I, J, K, L and M are used to control your sabre and the actions you take with it, while keys A, S and D control your movement. The game, in high-res colour, is easy to learn, yet as time passes the opposition gets better and more aggressive.

The documentation is adequate as there is very little instruction needed. The game has fairly good graphics, although they are limited to a few scenes with similar action.

To start you need to advance towards a pirate to engage him in combat. Care needs to be taken — he can kill you. If you succeed you then turn around to face another attacker at your rear. They keep coming at you, in increasing levels of skill and increasingly rapidly, as you work your way up the score-chart.

The various animals bob up at the most inopportune times to confuse you — you have to get them before they get you...

Swashbuckler is a different game in an age where so many programs are similar to some other programs. I like the game and found it entertaining. It certainly is a good program for the younger Apple owners.

One bug I found with the program is that after you kill two opponents you can keep your sword unsheathed and in the thrust position — the next opponent will walk directly into the sword and be killed.

Fun Foosball

This is another computer simulation of an old arcade game. *Foosball* was one of the old-style mechanical games often found at the agricultural shows or seedy pinball parlours of the pre-Space Invader vintage — the 'A little dab will do ya' days.

In the original version *Foosball* was

known as soccer or football and consisted of a machine with up to six handles a side to which five or six soccer players were attached. You furiously spun the handles so that the men attached would kick the ball towards the opposition goal. It was a game which required skill and fast reflexes.

It the Apple version the paddles are used to rotate the handles and kick the ball into the goal.

I was surprised that someone came out with a computer variation and was sceptical as to its interest value. I am still not completely convinced of the value of the game in the computer format — then again, I didn't do too well when I played it against some of my work colleagues.

I'm told it was a big hit in the *Your Computer* office, where they seem to be spending all their time lately 'testing' a whole pile of the new games sent in for review by *Imagineering*.

your computer



SOFTWARE REVIEW

A Sirius Minotaur

Minotaur is another game from that prolific crowd at Sirius. This is an arcade style game based on the maze concept.

It has four levels. Each of these levels is a maze in itself. Each of the four levels is connected by stairways, some going up and down, others only one way.

You have up to 99 lives to explore the maze. At each point you can see about five percent of the maze you are on. You are armed with a laser sword which helps you against the nasties you encounter on

your foolish endeavour.

You can acquire more lives along the way although you can never accumulate more than 99. When you do battle with a monster you can lose a life or two or more depending on the strength of the monster.

The monsters vary from wandering types like *Furies* and *Skeletons* to the personal henchmen of the *Minotaur*, the *Charon*. The other fixed monsters which are found only in certain places are the dragon snakes, cyclops centaurs and cobras.

Actually, to digress at this point, I am amazed at the ability of various software authors to devise names for these mythical beasts — some actually put Tolkien to shame with their inventiveness.

Despair not, there are some traditional allies who will help you build up your strength; the fair *Virgin*, who allocates more lives, and surprisingly the *Skulls*. My theory on this is that these are the skulls of less fortunate adventurers and that they are trying to avenge their own demise by giving you the power to defeat the *Minotaur*.

Tools which assist you include: *Clubs* — you can break down walls and go through floors; *Elixirs* — which assist you to leave your body and travel through the maze as a spirit (however there are dangers to this); and *Wings* — these give you the ability to fly above the maze you are on and to get a perspective of where you are.

Minotaur is not easy at first and takes some time to master. It can be played with a keyboard, joystick or paddle. There are five speeds.

It is a good game, interesting and time-consuming — a very good variation on the maze theme.

Pursuit Of The Graf Spee

In the aftermath of WW1 the Germans were restricted by the Treaty of Versailles to construction of warships of 10,000 tons or less. This was assumed to mean that they would be unable to build ships more powerful than a typical cruiser mounting six inch guns, no match for the battleships of the British which could carry guns as large as sixteen inches.

As Hitler's Germany rearmed it still faced these constraints. Its answer was ships such as the *Graf Spee*, which had heavier armour than a cruiser and carried

eleven inch guns, almost as big as those of the heaviest battleships.

Intended as a commerce raider, the Graf Spee was meant to prey on the convoys of merchant ships which kept Britain supplied with vital materials, while being more than a match for any opposition less than battleship status. It was a pocket battleship.

Pursuit Of The Graf Spee is a simulation of the hunt for and eventual destruction of the Admiral Graf Spee, and bears a conceptual relationship to the game Computer Bismarck, also from SSI. Most of the time the computer displays a map of the South Atlantic which shows the coasts of South America and Africa with British or neutral ports.

The map is divided by a square grid, ships are represented by a single letter code and the density of merchant shipping is represented by varying numbers of white dots in each square. Also shown are the date, turn (AM or PM), and the weather.

The rule book the game provides two reference sheets which are very nicely produced and contain all sorts of essential information. The rules themselves are clearly written and relatively quite simple. The game can be for two players or solitaire.

All the games I played were solitaire, thus the Germans were controlled by the computer.

The campaign game starts on the first of December, 1939, with 12 allied ships including two aircraft carriers and one battleship, looking for the Graf Spee and its supply ship the Altmark.

The position of the Graf Spee is unknown and remains so until it attacks a merchant ship. Each unfortunate victim has a 50 percent chance of sending a radio message giving the position of its attacker.

On playing the game for the first time a few truths become apparent to the British player. One is that 12 ships is not a lot considering the territory. Also the British must always keep one eye on the fuel situation. Rushing around madly is very costly. However, sooner or later a position for the Graf Spee will be known, most likely from the last report of a merchant ship. This is when the fun begins.

The British must manoeuvre as quickly as possible to the general area to look for the Graf Spee. However any British ship has three times its normal chance (adjusted for weather) of finding something when it is in patrol mode — that is, not moving that turn.

If the Graf Spee should be spotted then the display switches to the tactical mode. This, while visually sparse, gives one all the necessary information to slog it out with the Graf Spee, however at this stage another fact becomes painfully obvious —

the Graf Spee is superior, leaving aside the battleships or aircraft carriers to any two or possibly three of your ships. Its eleven inch shells can penetrate the armour of most British ships at up to 28,000 yards, whereas those of your ships with six inch guns must get to within 6,000-8,000 yards to do significant damage.

Those of your fleet with eight inch guns do damage at 12-16,000 yards depending on where they hit. This disparity is what gives the Graf Spee such an advantage. Naturally this disappears if the British can stay afloat long enough to close the range.

There are a number of factors at work in even deciding whether to engage in combat, let alone how to manage such. It is here that the reference charts are essential. A thorough reading is recommended *before* the game.

At one stage a 'lucky' French light cruiser emerged from a fog bank very close to the Graf Spee. Seizing this chance for glory, it sped in to deliver a crippling blow with its torpedoes, only to discover that due to what must have been a rather severe period of French fiscal constraint, it was not equipped with them (shades of Argentina). Needless to say, such parsimony was rewarded as the Germans used a minimum of shells to sink the hapless ship.

The other option for the game is the December 13th, or historical scenario which recreates the situation of the Battle of the River Plate in which the British ships Ajax, Achilles and Exeter fought the Graf Spee.

The game starts with the sighting of the Graf Spee and goes immediately into the tactical mode. The computer has the Graf Spee turn away and run at top speed so if the British want to follow it is a long and dangerous chase.

I fought this scenario twice; on one occasion the Graf Spee was sunk without the loss of any of the three British ships although they were severely damaged. On the other, the Graf Spee sank all three opponents without sustaining major damage. On the balance of probabilities the second would seem more likely to occur than the first.

Historically the British did damage the Graf Spee, though receiving much more punishment in return. The Graf Spee made for the neutral port of Montevideo where, three days later, believing himself to be now blockaded by heavily superior British forces, the commander of the Graf Spee scuttled the ship and shot himself.

The game can take from between one to two hours, depending on the scenario chosen and the amount of tactical fighting. The rules and commands are quite simple, the challenge lying in the strategic use of the ships.

It is also possible to select from one of four levels of difficulty and to have the combat decided off-line — that is, by use of naval miniatures, pistols at dawn or whatever.

The game provides a good strategic simulation with an adequate tactical one, the tactical game getting full marks for speed. □

Games Software Report Card

Program:	Pursuit of the Graf Spee
Made By:	Strategic Simulations
Available for:	Apple II 48K disk
Reviewed By:	Greg Whiley/Peter Sandys

Ratings:	Excellent	Very good	Good	Poor
Ease of Use:		✓		
Speed:		✓		
Entertainment value		✓		
Educational value:			✓	
Documentation:	✓			
Value-for-money:		✓		
Suitable for (ages):	10 — 110			
Price:	\$6995			
Review Unit from:	Strategic Simulations Inc, California			

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Need A Bag Of Tricks?

EVER HAD one of those days when problems kept on appearing? If your problems were disk failures, then we may have found something here to help you.

Even if you don't have a penchant towards Cecil, the delicate chappie pictured on the manual's cover, and don't carry diskettes around in your handbag (which might be the cause of his problems), you may still find this package of four separate programs useful.

Each of the four programs is extremely well documented, and although they are obviously written by different people (because of the differing command formats), they complement each other in function. None of them is the type of program you would need to use every day, so it is important that the explanation of commands be fairly concise but informative.

Each of the programs has a tutorial in the manual, plus some very interesting detail on various aspects of disk structure.

Some of the explanations get right down to the bits-and-bytes level, so if you are not up to that sort of thing, you might be well advised to stay clear. However, if you feel that you would like to find out more about the way the system controls the physical recording of data on a diskette, then this product not only provides

By Caroline Christie

some detailed information in this area, but also some tools to fiddle around with the disks at the most basic level.

The four programs provided are TRAX, INIT, ZAP and FIXCAT.

TRAX will read any track from a diskette and display the data on the screen, highlighting any anomalies in sector formatting, checksum errors and the like (if it is not too confused by what it finds).

INIT allows you to format any or all tracks on a diskette, and will attempt to preserve readable data on a track (if you so desire) so that a single unreadable sector can be formatted without the loss of any other data on the diskette. The other main function of this program is to allow you to specify the physical order of sectors on a track. The objective of this is to decrease the load time for sequential files, and is explained in detail in the manual.

The third program, ZAP, is the most complex of them all and therefore the hardest to learn how to use.

The basic function is to allow the modification of any part of the disk. The commands available with which to do this look quite complicated at first glance, (but ok a

general understanding is gained it is possible to do some useful things (and also some disastrous ones) without too much effort.

The last of the suite, FIXCAT, provides a simple catalog check and fix-up procedure. Other functions provided by this program are the recovery of 'lost' files on a disk, removing the DOS boot image from the first 2 tracks of the disk (every bit of storage space counts), and the correction of the VTOC freespace map.

Not only do these programs provide some extremely useful functions, but also the authors have some fascinating approaches to 'user friendliness'.

When using INIT, it is not necessary to type in any answers to questions. It is only a matter of 'rotating' through the given values with the left and right arrow keys until the desired answer is displayed.

The FIXCAT program asks you how long you want it to wait after writing each question on the screen before using the default answer to each question. In this way, by setting the value at 1 second, it is possible to leave it to answer all its own questions, and run through all its tests.

The documentation provides some interesting details of the function of diskettes and a complete description of the function and commands for each program. My only warnings to potential users are — do NOT, under any circumstances, attempt to find the cartoons funny and, second, watch out for Cec... □

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tutorial

Basic For Birdwatchers

Part X

This month, in the quest for ever more efficient means of storage, Les Bell introduces linked lists and binary trees.

SO FAR, in our search for efficient means of disk storage, we have looked at straight (linear) lists, sorted lists, indexed lists and a variety of access methods such as hashing and binary searching. All of these work quite well in certain applications, but they each have drawbacks.

However, considerably more powerful techniques are still available to us (there's more to this computer science than meets the eye!). These include various kinds of more refined dynamic data structures such as linked lists and the several varieties of trees. The basic key to understanding these is the idea of the linked list.

In a linked list, each record (or node) contains at least one extra field; this contains information about where to find the next record. The information depends upon the particular implementation and computer.

For example, in a linked list which is maintained completely in memory, the link pointer may contain an address, while a linked list which forms part of a disk operating system may contain track and sector numbers.

Let's look at a linked list in memory. To choose an example near to our hearts, we'll examine the way that a typical BASIC interpreter stores the lines you type into it.

Typically, the BASIC interpreter lives at the bottom end of memory, extending up for, say, 16K or so. At the top end of mem-

ory is the microprocessor's stack. In between is a space of 24K or so which must hold your program, all variables including strings, and disk buffers.

As you can imagine, some sophisticated techniques are used to get the best out of that memory space.

Now let's think about the problems the BASIC interpreter encounters as you type in your program. Each line is numbered, and if you've been good and written your program out on paper first, then you'll type them out in order without any mistakes. Storing such a program internally is a cinch — just a straight sequential list will do the job.

However, BASIC is rather more accommodating than that, and allows lines to be entered in any order. What would you do if a line was to be inserted into a linear list? Push down all the following lines, character by character, as the new line is typed in? If you do, you'll find that your typing speed will be very slow as you enter a line at the beginning of a long program. In fact, some word processors suffer from this very problem.

Linked Lists To The Rescue

Similar problems arise when replacing a line or editing it to make it either shorter or longer. There has to be a better way. And there is — linked lists to the rescue!

Suppose we store our lines in the following way: The first part of a line is the line number, stored as an integer. Next comes the address of the next line in memory, also stored as an integer. Third, we store the line itself, either as text or in some compressed form. This is shown diagrammatically in Figure 1.

Here we have a five-line BASIC prog-

ram stored in memory, as the interpreter sees it. The interpreter has an internal memory location which knows the location of the first line.

Usually, after you type 'NEW', this will always be in the same location, but if you normally start your programs at line 100, then later add a line 95, this will change (think about it).

Thereafter, each line actually contains the address of the following one, rather like a thread linking them all together. Finally, the last line of the program will have a link value of zero, to tell the interpreter that it is the last (a BASIC line could never be placed at location 0).

On drawings of lists, a link to zero is always shown as the electrical 'earth' symbol.

Now, adding a line onto the end of the program is very easy. We simply insert it somewhere (anywhere within reason) in memory, with a link field of zero, and change the link field of the old last line to contain the address of the new one. See figure 2.

Inserting into a linked list is almost as easy. First we look at the line before the insertion point, and store its link value into the new line. Then we set its link to point to the new line, and that's it. The result is shown in figure 3.

Now, in the figures so far, I've shown the lists as proceeding in an orderly manner down the page. If the program lines are typed in sequentially, that's the way the list will grow in memory. Note, though, that the lines will be 'butted up' tightly against each other with no room between them for a line to be inserted.

This means that a line will normally be placed at the end of the list, but linked in in

...THIS MONTH
IN THE QUEST
FOR... AH...
...SOMETHING...
...EFFICIENTLY
STORED LES
BELL HAS
HIS LISTS
LINKED... UGH...

SUH? WE'VE LOCATED A
BINARY TREE &
EXCAVATED
DOWN TO ITS
HIGHEST
LIMBS... SUH!

RIGHTO! BRING ON
THE HORSE!...
HORSE? ...OF COURSE!
THAT'S HOW
THEY LINCH'EM
IN THE
FLICKS!

OF COURSE...
BINARY TREES
GROW
UPSIDE DOWN...

...DON'T WORRY SIR... THE READERS
KNOW AS MUCH
ABOUT ANIMALS
AS THE 'ARTIST'
KNOWS ABOUT
COMPUTERS...

NO BULL?

QUIT THAT!

OK... GET THAT NOOSE AROUND
HIS TOPMOST NODE..... READY...

YE BINARY
TREE

G
R
A
A

...IT DIDN'T WORK!... HE'S
SUPPOSED T'GO UP!

MAYBE HE
HAS A DISK
BUFFER, SUH?

OK! LET'S DO
IT AGAIN!

HELP!
HELP!

..AT THIS MOMENT...

THRAAT! THRAAT!
PACOOT! PACOOT!
PACOOT! PACOOT!

WHAT'S
THAT?.. SUH?

MY GOD!...
IT... IT'S
THE.....

HOORAY! SAVED BY
THE CAVALRY!..

CHOKE

THANKS FELLOWS...
...A TRULY GALAANT
GESTURE...

...WELL... UH... NOT REALLY... WE...
ER... NEED YOUR COLLECTION OF
GARBAGE... SORRY... GARBAGE
COLLECTION... TO... AH... MAKE OUR
STUFF LOOK GOOD!

YEH... A
VALUABLE
CONTRIBUTION...

YEH...
LGBJ.KHAT

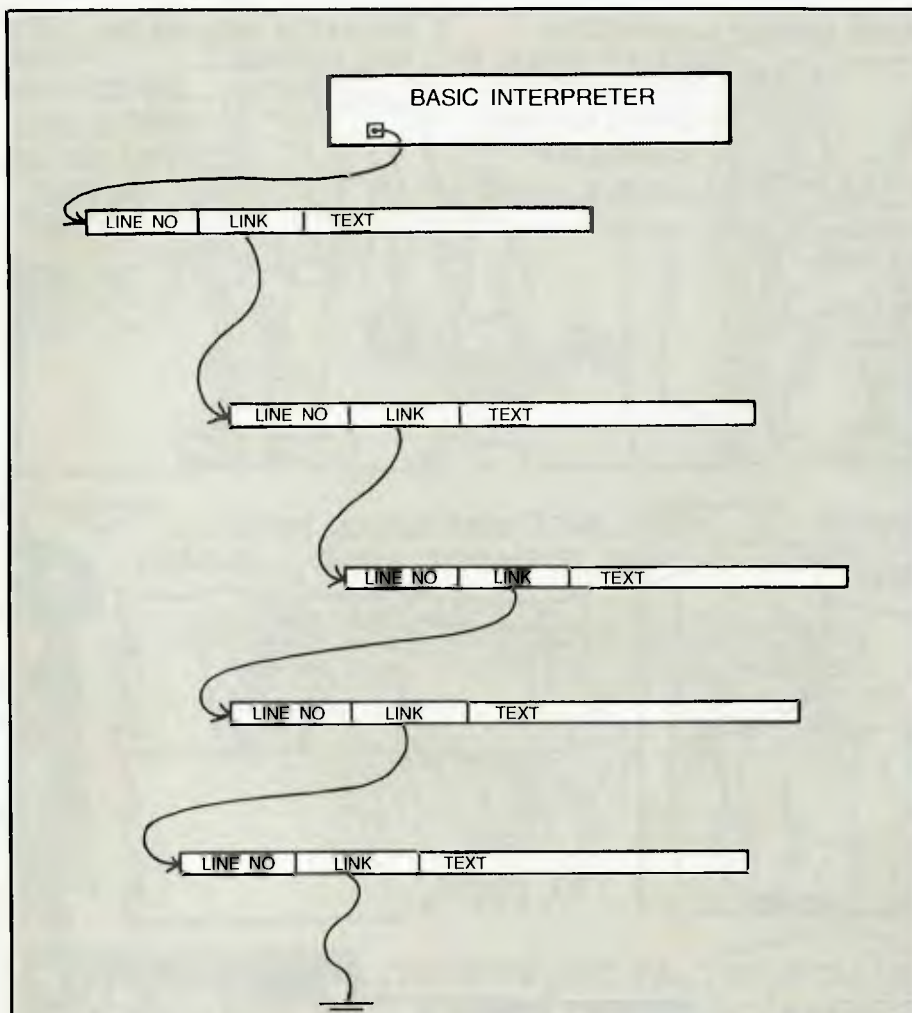


Figure 1. Basic program stored as a linked list.

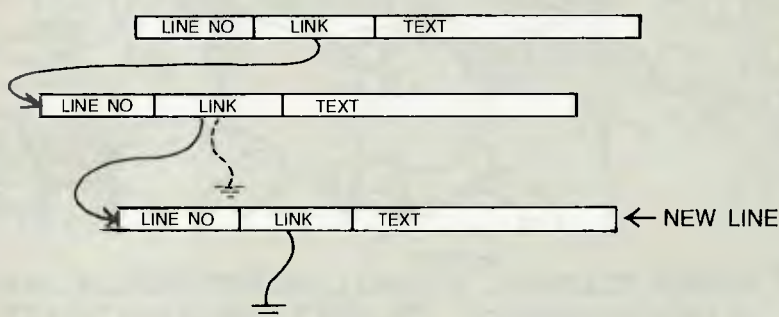


Figure 2. Appending to a linked list.

exactly the same way. Although it is physically located at the end of the list, when the interpreter executes or lists the program by tracing its way along the links, the line will appear in its correct position. See figure 4 for a graphic representation of this.

Deleting a node from a linked list is straightforward too; it's the reverse of insertion. We look at the node preceding the

one to be deleted, and copy the link from the one to be deleted into its predecessor. That's it.

Of course, it leaves a 'hole' in memory where the line used to be. This will be wasted space unless we do something about it. The answer is to grab the space back by appending it onto another list, consisting of deleted lines, and known as the 'free list'.



From now on, if a line is to be inserted, we can quickly check down the free list to find a space which will accommodate it. If one is found, we put the line into it and delete it from the free list, inserting it into the program list.

Of course, lines will not usually be exactly the same length as the spaces they occupy, leaving a few bytes spare. And as a program grows in memory, so will the free list. The free list will also consist of progressively smaller and smaller, and consequently less useable, spaces.

Eventually, the machine runs out of space, and something has to be done about it.

Collecting The Garbage

The answer is garbage collection. Without the aid of any glad bags, a program called the garbage collector runs down the free list collecting up the spaces, and at the same time packing up the program lines to eliminate the spaces between them.

This repacks the program more tightly and collects all the itty-bitty spaces into one useable lump.

By this stage it should come as no surprise to you to learn that BASIC stores its strings in exactly the same way. As you concatenate, delete and otherwise work with strings, they are moved around on a linked list, and there is an associated free list.

If you're running out of string space, the garbage collector will come along and re-shuffle everything into a tighter configuration.

This is why storing machine code programs as strings and then using the VARPTR function to access them can sometimes cause you grief; the garbage collector is quite likely to arbitrarily shift your program out of the way and put something else in its place.

Incidentally, for those who think that garbage collection and linked lists are 'big machine' techniques, the HP-41C pocket calculator uses just this method to cram programs into memory, which is why it can sometimes down tools and display

'PACKING' or 'WORKING' for 20 seconds or so. Garbage collection is a slow process on any computer.

Putting The Concept To Work

We could quite easily apply the idea of linked lists to a mailing list or similar program. When FIELDing up a record, we would merely have to provide an extra field for the link. After reading the first record of the file we can then carry on by putting the link field into a variable and then doing a GET using that variable to index into the file.

By repeating the process, we can read through the file in alphabetical order. Inserting records into the file is quite easy, and only requires a few random reads and writes, so it's quite quick.

The problem arises when we try to randomly access the file. There's just no way it can be done! The records aren't in consecutive order, and there's no way hashing or binary search will get us near the record we want. So for applications where fast random access is required count linked lists out.

On the other hand, you can't rule linked lists out totally, since there is no reason why you can't maintain a table of extra links into the middle of the list; say, 25 extra links, one for each letter of the alphabet. Then you can perform a sequential search on just a section of the list — something you can get away with on small lists.

Other advantages of linked lists: they make it easy to join lists together or break one apart; common information can be shared (for example, two people with different names can share one address); clever schemes with multiple links and tables of links can be constructed.

As an example of the last, consider the case in a line-oriented text editor, where you may want to look backwards through a text. In this case, an extra link field can be added, which gives the address of the preceding line, as well as the successor. Now sequential access is possible in both directions.

The idea of doing tricks with links leads on naturally to the subject of trees. So far, all the data structures we've discussed have been linear; that is, they have one beginning and one end. Trees don't work that way.

Suppose we define a record for a person whose surname is Michaels, and we make this the first record in a file. We

can always access the first record by just reading the file. Suppose we define two link fields, each of which leads further into the file (obviously) and one of which is for names lexicographically less than our first record, and the other for names greater than it.

Suppose we follow down to the 'left', to the names starting with letters before M,

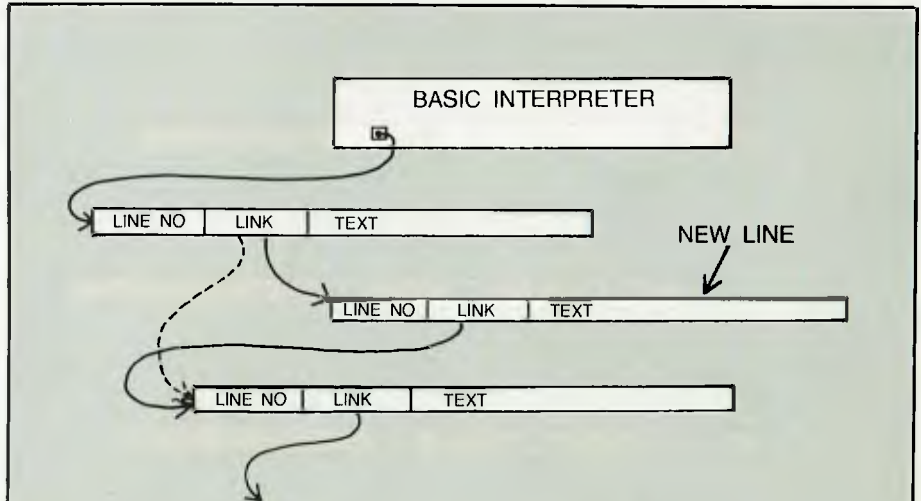


Figure 3. Inserting into a linked list.

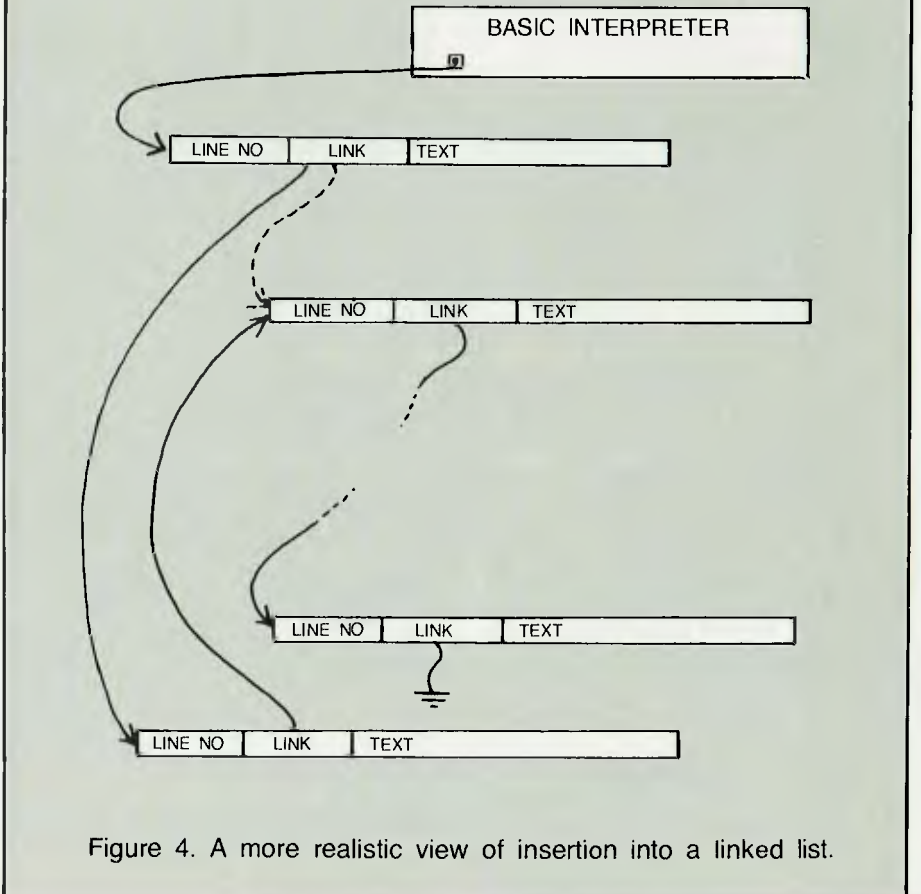


Figure 4. A more realistic view of insertion into a linked list.





and find that this takes us to a node for a Mr. Green. Now taking the 'right' link, we wind up with Mr Johnson. At this stage, the right node is zero, so we now know that Mr Lessing, for whom we were searching, is not on file. Why?

Look at Figure 6. This shows a simple binary tree for a few names and addresses. If you think back to our earlier discussion on binary searching, you will see a certain similarity between that technique and searching a binary tree.

Notice, from the drawing, that binary trees grow upside down. The topmost node, that for Michaels, is known as the root node, and the nodes below it are known as sons (or daughters, if you feel that way). Two nodes with the same parent are known as brothers, sisters, or siblings, depending upon your preference.

The left link points to a son which has a lexicographic value less than the parent, while the right link points to a son of greater (or equal) lexicographic value.

Now, how could one get an alphabetic listing of such a data structure. This is known as *traversing* the tree, and is really quite a simple process (though it probably gave its discoverer a few sleepless nights).

The process begins with the root node. Start at the left link of the node. If there is a son, move down to it. If there is not, print the contents of the node, and then move to the right link. If there is a son there, go to it. Otherwise, climb back up (down?) the branch that brought you there.

Repeat this process for every node visited, and the result will be an alphabetic listing! The process is shown diagrammatically in Figure 6. Basically it involves climbing down the left side of every link and up the right side, printing each node's contents as you pass across its underside between the left and right links. This sounds complicated but is actually quite simple.

Unfortunately, this is the kind of thing that BASIC does not shine at; other languages do it much better. However, next month we shall tackle the job of growing a binary tree, traversing it and even pruning it. □

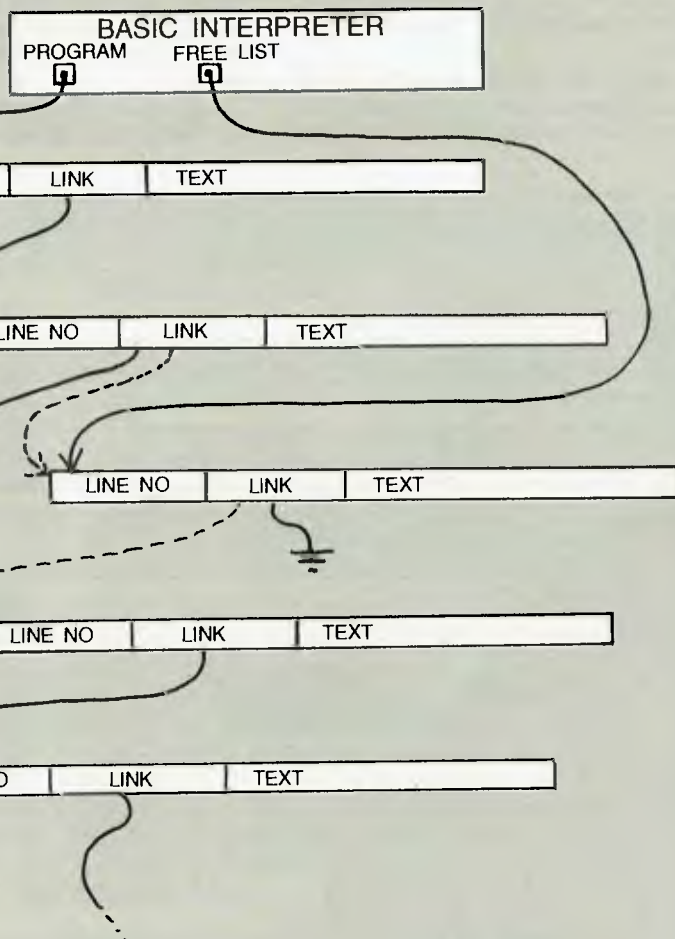


Figure 5. Deletion of a line from a linked list.

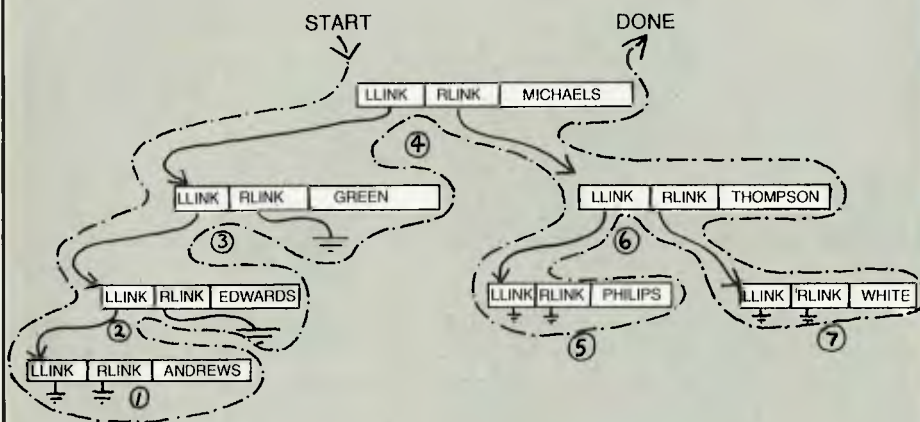


Figure 6. A simple binary tree of names.

----- TRAVERSAL PATH

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EXAMPLE: PROGRAM LISTING

```
820 Q$ = N$: J = 1, QL = 157
830 IF J> QL THEN Q = 0: RETURN
840 QM = (J + QL)/2
850 IF Q$<Q$ (QM) THEN QL = QM + 1: GOTO 830
860 IF Q$>Q$ (QM) THEN QL = QM - 1: GOTO 830
870 Q = 1: RETURN
```

CROSS REFERENCE LISTING

2	830 FROM	850	860
4	J	820	830 840 850
1	N\$	820	
2	Q	830	870
3	Q\$	820	850 860
2	Q\$()	850	860
4	QL	820	830 840 860
5	QM	840	850 860 860

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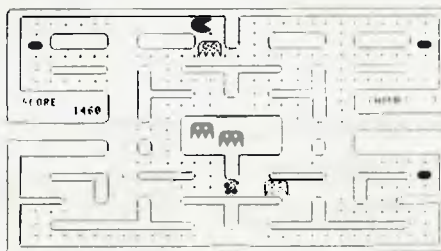
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THERE IS A great deal to be said for languages which are small enough to do sensible things in an efficient and elegant way. Just as the energy crisis convinced Americans that compact cars aren't so bad after all, so the microcomputer has led to a realisation amongst computer professionals that big isn't always better.

While the earliest BASIC interpreters for microcomputers were small, they rapidly grew into the Microsoft and similar software packages we know today. Other language systems followed a similar trend, and today's FORTRAN, Pascal, COBOL and C compilers are as big as, if not bigger than, many minicomputer packages.

On the other hand, one area which has given a lot of people a lot of pleasure and education is the implementation of so-called 'tiny' languages. Doctor Dobbs' Journal started it all in 1976 with its series of Tiny BASIC articles and listings (all around 2K in size), and subsequently tiny packages for other languages, such as Pascal and C, have appeared.

Gammon & Gobbett's G-Pascal follows in the tradition of being an interesting and extremely useable small language package, in this case for the Apple II computer. Its originator, Nick Gammon, was inspired by the original Tiny Pascal published in Byte magazine, but not having a North Star computer (for which it was written), he decided to use the articles as the basis for his own Apple-based Pascal compiler.

The result is a compiler which implements a useful subset of the Pascal language. While it does not have all the bells and whistles of a full Pascal compiler (user-defined types, for example, are missing), it is still a good tool for writing system utilities.

Simplicity Itself

G-Pascal is simplicity itself to install, particularly if you have an Apple II with 48K and DOS 3.3 — then it's just a matter of inserting the disk and booting.

your computer



SOFTWARE REVIEW

RAMCard users will find a larger version of the Pascal on the disk, and this can be set up to automatically load and run by making a loader program the 'HELLO' program on the disk.

The system is also available on cassette, and by changing only one location in memory, can be switched between cassette and DOS I/O. G-Pascal actually consists of a compiler, p-code interpreter and a text editor, all combined into one program which occupies 12K of memory.

Once the program has loaded, it will ask the user 'DISPLAY LOWER CASE? Y/N'. This allows use of lower case adapters. After this, the system is operational, and will sign on with a short copyright message and the main menu.

The main menu offers the user access to a number of subsystems, in much the same way as Apple Pascal 'proper':

(E)dit, (C)ompile, (D)ebug, (F)iles,
(R)un, (S)yntax, (T)race, (Q)uit ?

The Files subsystem allows source files to be loaded, saved or merged. It also offers control of the printer, so that a session can be recorded on hard copy, and allows DOS commands to be executed.

The editor is a fairly simple-minded but effective line-oriented type. Its commands are Compile, Delete line number range, Insert line number, List line number range, Modify line number range, Quit and Syntax, where line number is what you would expect and line number range is a pair of line numbers.

The compile option is the same as entering (C) from the main menu. Delete removes one or more lines from your program, with a query for more than five lines to prevent accidental grief. Insert adds lines after the line specified.

List works like you would expect, with the ability to 'freeze' and release the listing

by hitting the space bar. Modify works by listing the lines requested, then deleting them and entering insert mode to allow replacement. Minor changes can be made by using the Apple's cursor control codes to edit erroneous lines.

Quit returns the user to the main menu, while the Syntax option works the same way as from the main menu.

The compiler first asks the user if he/she wants a p-code listing; normally, this is not required. Next it asks if a listing is required. After this, it will go ahead and compile the program.

If the user does not want to generate code, but simply check for errors (useful when first writing a program) he can specify the 'Syntax' command as an alternative. This is identical to the compiler, but generates no p-codes.

Catching Sloppy Programming

If an error is found, the compiler will halt with an arrow pointing to the symbol being processed when the error was discovered, the word 'Error' and an error message. It then returns you to the editor to fix up your sloppy programming!

The output of the compiler is p-code (pseudo-code) which is then interpreted at run time. Each p-code is up to four bytes long, and the manual contains an explanation of what the p-codes mean. This, together with a trace mode of execution and a listing which has p-code addresses, means that it is possible to track down particularly recalcitrant bugs without too much difficulty.

The run-time interpreter also supports a debug mode, which shows the p-code being executed and its operands, the top eight bytes of the stack and the stack frame linkage data used to manage the data on the stack as procedures are called and exited.

G-Pascal is a subset of standard Pascal. While it omits some of the most powerful features of Pascal (for example, run-time range error checking), what remains is still powerful enough to be useful and to demonstrate the principles of structured program design.

Integers are stored as three-byte signed values and range from -8388608 to 8388607; constants may be expressed in either decimal or hexadecimal format. Char variables occupy a single byte, so that arrays of char are much more space-efficient than arrays of int. Other data types are not supported, nor is the **type** statement.

However, with some ingenuity, types can be simulated, as in the following example.

In full Pascal:

```
type
  colour = (red, green, blue);

var
  fred : colour;

begin
  fred := green
end.
```

In G-Pascal:

```
const
  red = 0; green = 1; blue = 2;

var
  fred : integer;

begin
  fred := green
end.
```

Both of these will have the same effect. String constants are supported, up to three letters in length, basically by storing them in an int variable. Of course, arrays of char are possible, and these would be the best way of dealing with strings where more than three letters are required.

Arrays can only be single-dimensional, and there is no run-time checking of subscript bounds. That's not really as serious a problem as it sounds, as it is possible to write checks into a program (good defensive programming!), and there are ways to simulate two dimensional arrays when only a single dimension is available (a computer's memory is only a single dimension anyway; all languages have to 'fake' multiple dimensions).

Identifiers can be any length, with all characters significant. One up for sensible programming. At last I can have a variable called `hereisalongvariable` and know the compiler knows it's different from `hereisalongvariabul`!

In order to support recursion, G-Pascal passes all arguments by value on the stack. This has the side effect of preventing a procedure returning a result by altering one of its arguments, as is possible in standard Pascal. On the other hand, it allows recursive calling of functions indefinitely or at least until the stack overflows.

G-Pascal supports a default extension to the case statement, through the use of an **else** clause at the end of the list of case selectors.

A Useful Extension

A useful extension is the MEM array, which is a pre-declared array of memory locations starting at zero. By using this array in assignment statements, peeking and poking are effectively emulated. A similar array, MEMC, is an array of char.

G-Pascal can read and write disk files using the same conventions as Applesoft BASIC and DOS. For example, the statement `WRITE (4, "CATALOG", 13);` will do

Software Report Card

Unit:	G-Pascal			
Made By:	Gammon & Gobbett Computer Services			
Useful for:	System utilities, games, education, Pascal			
Hardware Req'd:	Apple II, disk drive			
Ratings:	excellent	very good	good	poor
Documentation:		✓		
Ease of Use:		✓		
Speed:	✓			
Functionality		✓		
Support:		✓		
Value-for-money:	✓			
Extras Included:	N/A			
Price:	\$40			
Review Unit from:	Gammon & Gobbett Computer Services, PO Box 124, Ivanhoe, VIC 3079			

a catalogue of the disk.

Other extensions include the pre-declared integer `RANDOM`, the `CURSOR` statement, which is equivalent to the Apple Pascal `GoToXY` procedure, and the function `ADDRESS(identifier)` which returns the address of a variable.

G-Pascal also includes three built-in procedures for high-res graphics: `HGR`, which sets graphics mode and clears the screen, `HLOT(colour, column, row)`, which plots a point, and `TEXT`, which returns to text mode. The low-resolution graphics modes in the Apple monitor can be called from G-Pascal to do low-res plotting.

There is also a built-in procedure `MUSIC(pitch, duration)` which will generate tones.

The G-Pascal manual gives some useful addresses inside the system which allow the user to customise it. For example, normally the compiler generates code starting immediately after the source code in memory. This makes for quick recompilation when bugs are found.

With large programs, however, there might not be enough memory left over after the source has been loaded for the program to be compiled into. By changing two memory locations, the compiler can be set up to allow the p-code to overlay the source, thus permitting much larger programs to be compiled.

Similarly, the symbol table size can be altered, the right and left brackets changed from `'()'` to `'[]'`, the printer slot altered and so on.

The manual is well-written and informative, with plenty of examples of programs. Special sections outline the unique G-Pascal statements such as the high-res graphics functions, and there is particularly useful information on converting from other Pascals and debugging.

The reference information towards the back of the manual covers configuring the system, machine language subroutines and meanings of p-codes.

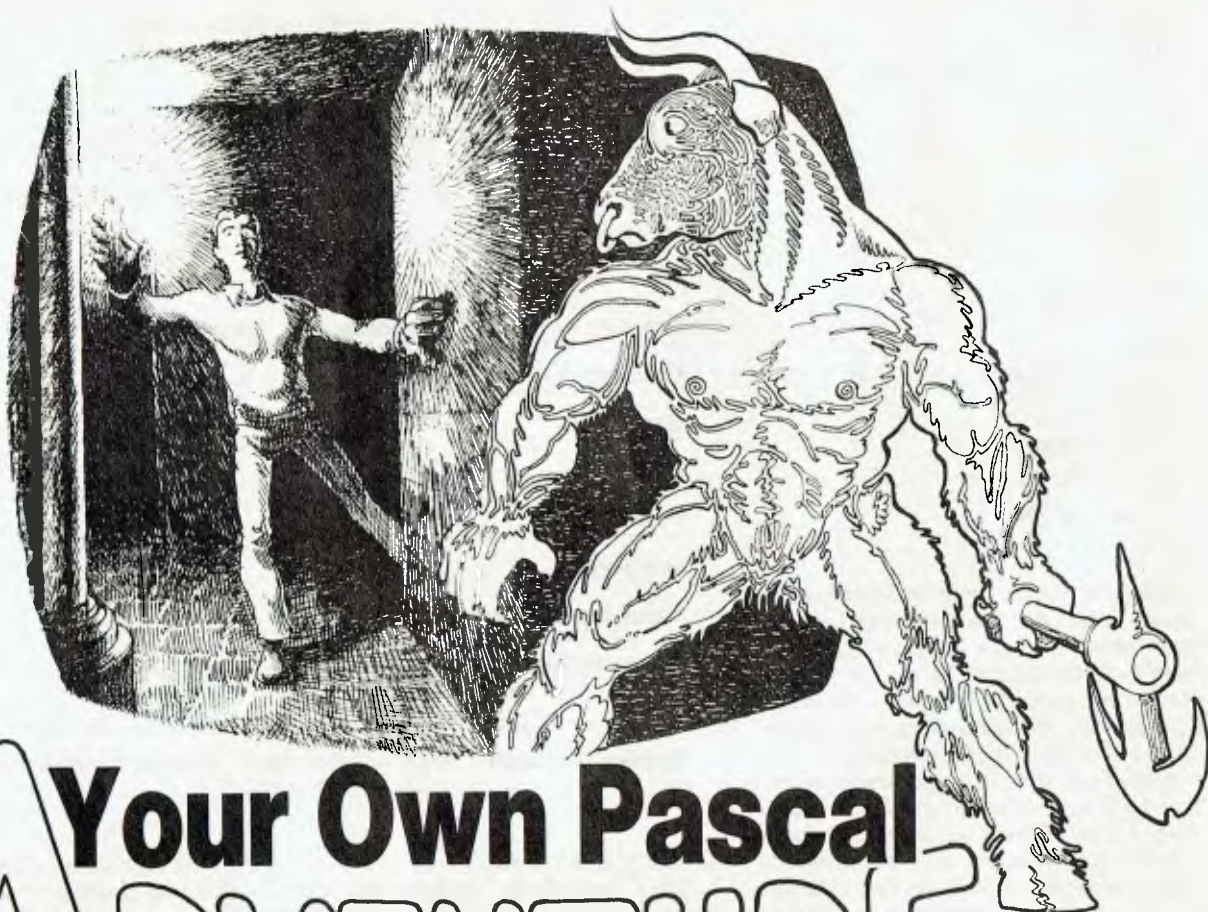
Amazing Value

G-Pascal is a compact but particularly potent package. It is especially useful for writing system utilities, as well as games, where its performance would be considerably faster than BASIC.

As an example of the kind of work that can be done in G-Pascal, Nick Gammon has written a complete Adventure game, and we hope to feature this in a future issue. After seeing the program, we can only say that once you know how it's done, you'll be surprised how simple it is (the same could not be said of a BASIC Adventure, however!).

We played around extensively with G-Pascal and found no bugs — however, Gammon & Gobbett did issue a bug fix sheet for early versions of G-Pascal (the fixes have been applied to later versions).

Not only does G-Pascal work well, it also represents amazing value for money, at only \$40 for the diskette and 58-page user manual. Contact Gammon & Gobbett Computer Services, PO Box 124, Ivanhoe VIC 3079.



Your Own Pascal ADVENTURE

G-Pascal author Nick Gammon presents a 'skeleton' adventure for our Pascal programmers to develop. It's a fun game on its own, and illustrates how easy it can be to produce such a seemingly complex program using this language. You can play it as is, modify it fairly easily for most Pascals, and turn it into a massive adventure saga...

EVER SINCE Crowther, Woods and Palmer wrote the 'original' Adventure game, computerised fantasy games have become very popular. Hardly a month goes by without a computer magazine somewhere printing another adventure-style game for its readers (usually in BASIC).

Probably quite a few of us have felt the desire to write our own adventure, but have been daunted by the seeming comp-

lexity of such games.

Writing a complex text-oriented game in Assembler code is tedious, and BASIC doesn't really lend itself to doing the job easily either, as well as being fairly slow.

Fortunately there is relief on the horizon — Pascal turns out to be a very good adventure-game medium, as this article illustrates.

Why Pascal?

Pascal makes the job easy because: Its long data names make the program self-documenting; the CASE statement is very useful for decision-making; and its strong structure makes it easy to debug and enhance.

The listing accompanying the article is a complete game, which will work if keyed in. However it is intended as a 'skeleton' adventure rather than the end product itself. Readers are encouraged to understand how the program works and then add their own plot, room and object descriptions to the game.

The particular Pascal implementation used is G-Pascal, a cheap, high-speed Pascal subset available for the Apple II.

Converting G-Pascal

With minor changes the game should run on other Pascals — you would probably have to rewrite the GETWORD procedure. If your Pascal has no ELSE clause on CASE statements you may need another couple of lines of code to check whether the CASE statements did what is intended.

Adventure games generally accept commands from the player in the form of two word sentences; for example, GET ROD or WALK NORTH (some of the more sophisticated adventure games, such as Zork, can interpret longer and more complicated sentences, such as TAKE EVERYTHING EXCEPT THE BOOK THEN GO NORTH.)

Our game expects commands to consist of a verb, followed in some cases by a noun. For the sake of brevity, movement

commands such as GO NORTH may be abbreviated to the direction only: NORTH (for example).

Commands are accepted from the player by GETLINE which reads a line of text from the player. GETLINE calls GETWORD twice to decode the text into two words. If GETLINE finds more than two words it asks the player to try again. You could easily accept more than two words by changing the constant MAXWORDS.

GETWORD may seem a bit obscure, but it basically 'packs' the first three letters of the next word on the input line into a single integer (G-Pascal uses 3-byte integers so this is a neat way of storing a three-letter word).

A side-effect of this is that our game only regards the first three characters of the word as significant. GETWORD also keeps track of where the whole word starts and ends, so if you say TAKE ANTELOPE it can reply I SEE NO ANTELOPE HERE rather than I SEE NO ANTELOPE HERE.

Our adventure player can take one of five general categories of actions: Move (for example, GO NORTH); Take something (TAKE ROD); Drop something (DROP LAMP); Use something (WAVE RING); and Other (SCORE, QUIT, INVENTORY).

Make A Move...

The player's current location is stored in ROOM. His or her previous location is stored in OLDRoom. If ROOM and OLDRoom differ the program prints a description of the current location by using a CASE statement in DESCRIBEROOM.

```
287 BEGIN
288   WRITE ("YOU ARE ");
289   CASE ROOM OF
290     1:
291       WRITE ("AT A PLATEAU NEAR A CLIFF.",CR);
292     2:
293       WRITE ("A ROCKY PATH LEADS SOUTH.",CR);
294     3:
295       WRITE ("ON A ROCKY PATH LEADING",CR);
296     4:
297       WRITE ("NORTH AND CURVING TO THE EAST. THERE",CR);
298     5:
299       WRITE ("IS A SLIGHT BREEZE.",CR);
```

DESCRIBEROOM also prints a description of all objects in the same room as the player:

```
422 FOR I := 0 TO MAXOBJ DO
423   IF INROOM(I) THEN
424     WRITE (CR,"THERE IS A ",
425           DESCRIBEOBJECT(I),
426           " HERE!",CR);
```

When the player enters a movement command such as NORTH, SOUTH, UP, DOWN and so on the VERB procedure calls the appropriate movement procedure. The movement procedures handle all movement by a single CASE statement — invalid directions are caught by the ELSE clause of the CASE.

```
477 PROCEDURE SOUTH;
478 BEGIN
479   CASE ROOM OF
480     1: ROOM := 2;
481     4: ROOM := 5;
482     5: ROOM := 6;
483     9: ROOM := 7;
484     7: ROOM := 11;
485     16: ROOM := 15;
486     17: ROOM := 16;
487     19: IF CARRYING(STATUE) THEN
488       ROOM := 18
489     ELSE
490       FORCE
491     ELSE NOWAY END
492 END;
```

Movement can be conditional — in the above example the player can only move from room 19 to 18 if carrying the statue.

To add more rooms to our game we merely have to add their descriptions to DESCRIBEROOM, and make provision for getting to and from them in the movement procedures.

Manipulating Objects

A lot of the fun on adventure games is finding 'objects' (such as lamps and rods) and discovering a use for them.

An object can either be carried, lying around somewhere, or nonexistent.

In our game we use an array, OBJECT, to contain the current location of each object. For example OBJECT (LAMP) is the location of the lamp. The locations are: -1, being carried; 0, nowhere; room number, lying in that room.

We now define some handy boolean functions which tell us if a given object is being carried, is in the room, or is here (meaning carried or in the room).

```
38 ROOM, OLDRoom : INTEGER;
39
40 FUNCTION CARRYING (X);
41 BEGIN
42   CARRYING := OBJECT (X) = INHAND
43 END;
44
45 FUNCTION INROOM (X);
46 BEGIN
47   INROOM := OBJECT (X) = ROOM
48 END;
```

We can now pick up an object by setting its location to -1, or drop it by setting its location to the current room number, for example:

```
121 PROCEDURE PICKUP (X);
122 BEGIN
123   IF HOLDING >= MAXCARRY THEN
124     WRITE ("YOU CAN'T CARRY ANY MORE!",CR)
125   ELSE
126     BEGIN
127       HOLDING := HOLDING + 1;
128       OBJECT(X) := INHAND;
129       WRITE ("TAKEN.",CR)
130     END
```

At this point you might ask: "If I say TAKE LAMP, how does the word 'LAMP' become a subscript in the OBJECT array?"

Good question! This conversion is carried out by CONVERTOBJECT:

```
63 FUNCTION CONVERTOBJECT;
64 BEGIN
65   OBJ := 0;
66   IF WORD(2) = 0 THEN
67     WRITE (SAYWORD(1)," WHAT?",CR)
68   ELSE
```

```
69 CASE WORD(2) OF
70   "LAMP": OBJ := LAMP;
71   "BUN": "CRE": OBJ := BUN;
72   "ROD": OBJ := ROD;
73   "RING": "GOL": OBJ := RING;
74   "SIL": "STA": OBJ := STATUE;
75   "JEW": "CRO": OBJ := CROWN;
76 ELSE
77   OBJ := 9999
78 END; (* CASE *)
79 CONVERTOBJECT := OBJ
```

CONVERTOBJECT uses a CASE statement to convert the name of any object (or its synonym/s) into a value which is stored in OBJ. (The actual numbers are stored as constants at the start of the program to avoid confusion and make the program more self-explanatory).

CONVERTOBJ also prints 'WHAT?' if the player has not supplied a noun, so if you just say TAKE it will reply TAKE WHAT?

CONVERTOBJECT is called by the boolean function GETOBJECT whose function is to check that the requested object is in the right place.

Since GETOBJECT returns true or false you can write (for example): IF GETOBJECT (CARRIED) THEN statement;

In this case the statement is executed if: a noun was supplied; it is a valid object name; and it is being carried.

If the statement is executed then the object number is in OBJ, otherwise the appropriate error message will already have been printed.

This greatly simplifies programming the rest of the game. For example, here is how we handle the verb EAT:

```
431
432 PROCEDURE EAT;
433 BEGIN
434   IF GETOBJECT(NEARBY) THEN
435     IF OBJ = BUN THEN
436       BEGIN
437         WRITE ("THANKS! YOU WERE RATHER HUNGRY!",CR);
438         DESTROY(BUN)
439       END
440     ELSE
441       CRAZY
442 END;
```

To Add More Objects...

Here's how to add more objects to the game:

- Increase MAXOBJ to the appropriate size.
- Allocate an internal name and sequential number to each object in the CONST declaration at the start of the program (see lines 22 to 29).
- Put the description of each object in DESCRIBEOBJECT.
- Put the external name to internal name conversion in CONVERTOBJECT.
- Allocate the object's initial room number (if any) in INITIALIZE.
- Decide what the use of the object will be and put it in an appropriate procedure. For example, a book might be read, or a key might open a lock.

Expanding The Program

To turn this game into a full-scale adventure you would need to: create more

rooms; create more objects; create more verbs (for example, READ, LOCK, OPEN, magic words and so on.)

It might be necessary to store room descriptions on disk as a text file (for example) if the game becomes too big to fit into memory.

You would probably want to keep the last five or so room descriptions in mem-

ory so that you don't keep accessing the disk as the player blunders backwards and forwards between a couple of rooms. Your imagination is the limit — enjoy creating your own scenarios!

If you don't yet own a copy of G-Pascal, or would like a copy of the adventure prog-

ram on disk to save typing 730 lines of code, send a cheque to Gambit Games, P.O. Box 124, Ivanhoe, Victoria 3079. (For Apple II only). G-Pascal on disk with user manual costs \$40. The disk with adventure game and listing is \$20, or you can get both combined for \$50. Price includes airmail postage within Australia. ☐

```

1 (* ADVENTURE-STYLE GAME
2
3   AUTHOR: NICK GAMMON *)
4
5 CONST
6
7 HOME=5;
8 CR=13;
9
10 FALSE=0;
11 TRUE=1;
12
13 INHAND = -1;
14 MAXOBJ=6;
15 MAXWORDS=2;
16 MAXCARRY=3;
17
18 CARRIED=1;
19 NOTCARRIED=2;
20 NEARBY=3;
21
22 (* OBJECTS *)
23
24 LAMP=1;
25 BUN=2;
26 ROD=3;
27 RING=4;
28 STATUE=5;
29 CROWN=6;
30
31 VAR
32
33 LINE : ARRAY (100) OF CHAR;
34 OBJECT : ARRAY (MAXOBJ) OF INTEGER;
35 WORD, STARTWORD, ENDWORD :
36   ARRAY (MAXWORDS) OF INTEGER;
37 HOLDING, SCORE, TURNS, OBJ, PTR,
38 ROOM, OLDROOM : INTEGER;
39
40 FUNCTION CARRYING (X);
41 BEGIN
42   CARRYING := OBJECT (X) = INHAND
43 END;
44
45 FUNCTION INROOM (X);
46 BEGIN
47   INROOM := OBJECT (X) = ROOM
48 END;
49
50 FUNCTION HERE (X);
51 BEGIN
52   HERE := CARRYING (X) OR INROOM (X)
53 END;
54
55 FUNCTION SAYWORD (X);
56 VAR I : INTEGER;
57 BEGIN
58   FOR I := STARTWORD(X) TO ENDWORD(X) - 1 DO
59     WRITE (LINE(I));
60   SAYWORD := 0
61 END;
62
63 FUNCTION CONVERTOBJECT;
64 BEGIN
65   OBJ := 0;
66   IF WORD(2) = 0 THEN
67     WRITE (SAYWORD(1)," WHAT?",CR)
68   ELSE
69     CASE WORD(2) OF
70       "LAM": OBJ := LAMP;
71       "BUN", "CRE": OBJ := BUN;
72       "ROD": OBJ := ROD;
73       "RIN", "GOL": OBJ := RING;
74       "SIL", "STA": OBJ := STATUE;
75       "JEW", "CRO": OBJ := CROWN
76     ELSE
77       OBJ := 9999
78     END; (* CASE *)
79   CONVERTOBJECT := OBJ
80 END;
81
82 FUNCTION DESCRIBEOBJECT (X);

```

```

83 BEGIN
84   CASE X OF
85     LAMP: WRITE ("LAMP");
86     BUN: WRITE ("CREAM BUN");
87     ROD: WRITE ("ROD");
88     RING: WRITE ("GOLD RING");
89     STATUE: WRITE ("SILVER STATUE");
90     CROWN: WRITE ("JEWELLED CROWN")
91   END;
92   DESCRIBEOBJECT := 0
93 END;
94
95 FUNCTION GETOBJECT (MUSTBE);
96 BEGIN
97   GETOBJECT := FALSE;
98   IF CONVERTOBJECT THEN
99     BEGIN
100       IF NOT HERE(OBJ) THEN
101         WRITE ("I SEE NO ",SAYWORD(2),
102           " HERE.",CR)
103       ELSE
104         CASE MUSTBE OF
105           CARRIED:
106             IF CARRYING(OBJ) THEN
107               GETOBJECT := TRUE
108             ELSE
109               WRITE ("YOU'RE NOT CARRYING IT!",CR);
110           NOTCARRIED:
111             IF NOT CARRYING(OBJ) THEN
112               GETOBJECT := TRUE
113             ELSE
114               WRITE ("YOU'RE ALREADY CARRYING IT!",CR)
115           ELSE
116             GETOBJECT := TRUE
117         END
118       END
119     END;
120
121   PROCEDURE PICKUP (X);
122   BEGIN
123     IF HOLDING >= MAXCARRY THEN
124       WRITE ("YOU CAN'T CARRY ANY MORE!",CR)
125     ELSE
126       BEGIN
127         HOLDING := HOLDING + 1;
128         OBJECT(X) := INHAND;
129         WRITE ("TAKEN.",CR)
130       END
131     END;
132
133   PROCEDURE DROPIT (X);
134   BEGIN
135     HOLDING := HOLDING - 1;
136     OBJECT(X) := ROOM;
137     WRITE ("DROPPED.",CR);
138     IF ROOM = 1 THEN
139       IF (INROOM(RING))
140         AND(INROOM(STATUE))
141         AND(INROOM(CROWN)) THEN
142       ROOM := 0; (* FINISHED QUEST! *)
143     END;
144
145   PROCEDURE DESTROY (X);
146   BEGIN
147     IF CARRYING(X) THEN
148       HOLDING := HOLDING - 1;
149     OBJECT(X) := 0
150   END;
151
152   PROCEDURE OK;
153   BEGIN
154     WRITE (CR,CR,"OK.",CR)
155   END;
156
157   PROCEDURE TAKE;
158   VAR I : INTEGER;
159   BEGIN
160     IF WORD(2) = "ALL" THEN
161       FOR I := 0 TO MAXOBJ DO
162         IF INROOM(I) THEN
163           BEGIN
164             WRITE (DESCRIBEOBJECT(I),": ");

```



```

165     PICKUP(I)
166     END ELSE
167 ELSE
168 IF GETOBJECT (NOTCARRIED) THEN
169     PICKUP (OBJ)
170 END;
171
172 PROCEDURE DROP;
173 VAR I : INTEGER;
174 BEGIN
175     IF WORD(2) = "ALL" THEN
176         FOR I := 0 TO MAXOBJ DO
177             IF CARRYING(I) THEN
178                 BEGIN
179                     WRITE (DESCRIBEOBJECT(I),": ");
180                     DROPIT(I)
181                 END ELSE
182             ELSE
183                 IF GETOBJECT (CARRIED) THEN
184                     DROPIT (OBJ)
185             END;
186
187 PROCEDURE INSPECT;
188 BEGIN
189     IF GETOBJECT (NEARBY) THEN
190         CASE OBJ OF
191             ROD, RING, STATUE
192             : WRITE ("MAGIC SEEMS TO ",
193                 "EMANATE FROM THE ", SAYWORD(2), " ...", CR);
194             BUN: WRITE ("IT LOOKS TASTY!", CR)
195             ELSE
196                 WRITE ("YOU SEE NOTHING SPECIAL", CR)
197             END
198         END;
199
200 PROCEDURE LOOK;
201 BEGIN
202     IF WORD(2) = 0 THEN
203         OLDDROOM := 0
204     ELSE
205         INSPECT
206     END;
207
208 PROCEDURE CRAZY;
209 BEGIN
210     CASE TURNS MOD 4 OF
211         0:WRITE ("DON'T BE RIDICULOUS!", CR);
212         1:WRITE ("NICE TRY.", CR);
213         2:WRITE ("I WOULDN'T!", CR);
214         3:WRITE ("THAT'S A *VERY* SILLY IDEA!", CR)
215     END
216 END;
217
218 PROCEDURE DONTUNDERSTAND;
219 BEGIN
220     CASE TURNS MOD 4 OF
221         0:WRITE ("WHAT?", CR);
222         1:WRITE ("PARDON?", CR);
223         2:WRITE ("I DON'T UNDERSTAND THAT!", CR);
224         3:WRITE ("EH?", CR)
225     END
226 END;
227
228 PROCEDURE GETWORD (X);
229 VAR I : INTEGER;
230 BEGIN
231     WORD(X) := 0;
232     I := 0;
233     WHILE LINE(PTR) = " " DO
234         PTR := PTR + 1;
235     STARTWORD(X) := PTR;
236     WHILE (LINE(PTR) <> CR) AND
237         (LINE(PTR) <> " ") DO
238         BEGIN
239             IF WORD(X) AND $FF0000 = 0 THEN
240                 WORD(X) := WORD(X) + (LINE(PTR) SHL I);
241                 I := I + 8;
242             PTR := PTR + 1
243         END;
244     ENDWORD(X) := PTR
245 END;
246
247 PROCEDURE GETLINE;
248 VAR I : INTEGER;
249 BEGIN
250     WRITE (CR);
251     REPEAT
252         READ (LINE);
253         LINE(100) := CR;
254         PTR := 0;
255         FOR I := 1 TO MAXWORDS DO
256             GETWORD (I);
257         WHILE LINE(PTR) = " " DO
258             PTR := PTR + 1;
259         IF LINE(PTR) <> CR THEN
260             BEGIN
261                 WORD(1) := 0;
262                 WRITE (CR, "PLEASE USE NO MORE ",
263                     "THAN ", MAXWORDS#, " WORDS", CR, CR)
264             END
265         UNTIL WORD(1) <> 0
266     END;
267
268 PROCEDURE INSTRUCTIONS;
269 BEGIN
270     WRITE (
271         "YOUR QUEST IS TO EXPLORE THE CAVE OF", CR,
272         "THE EVIL UR-LORD, AND BRING BACK TO", CR,
273         "THE EDGE OF THE CLIFF THE FOLLOWING", CR,
274         "VALUABLES:", CR, CR,
275         " 1. THE WHITE GOLD RING;", CR,
276         " 2. THE SACRED SILVER STATUE;", CR,
277         " 3. THE JEWELLED CROWN OF THE UR-LORD.", CR, CR, CR,
278         "BE CAREFUL ...", CR, CR, CR)
279 END;
280
281 PROCEDURE DESCRIBEROOM;
282 VAR I : INTEGER;
283 BEGIN
284     IF (ROOM > 4) AND (NOT HERE(LAMP)) THEN
285         WRITE ("IT'S TOO DARK TO SEE!", CR)
286     ELSE
287         BEGIN
288             WRITE ("YOU ARE ");
289             CASE ROOM OF
290                 1:
291                 2:
292                 293 WRITE ("AT A PLATEAU NEAR A CLIFF.", CR,
294                 294 "A ROCKY PATH LEADS SOUTH.", CR);
295                 296 2:
297                 298 WRITE ("ON A ROCKY PATH LEADING", CR,
299                 299 "NORTH AND CURVING TO THE EAST. THERE", CR,
300                 300 "IS A SLIGHT BREEZE.", CR);
301                 302 3:
303                 304 WRITE ("AT THE ENTRANCE TO A DARK", CR,
305                 305 "CAVE. A ROCKY PATH TO THE WEST", CR,
306                 306 "CURVES NORTH.", CR);
307                 308 4:
309                 310 WRITE ("JUST INSIDE A DARK CAVE.", CR,
311                 311 "LIGHT COMES FROM AN ENTRANCE TO THE", CR,
312                 312 "WEST. THERE IS A DARK, MOULDY SMELL.", CR,
313                 313 "A TUNNEL LEADS SOUTH.", CR);
314                 315 5:
316                 317 WRITE ("IN A LOW NORTH/SOUTH TUNNEL.", CR);
318                 319 6:
320                 321 WRITE ("IN AN OVAL CAVERN WITH AN", CR,
322                 322 "EXIT TO THE NORTH. THERE IS A", CR,
323                 323 "FORBIDDING STONE STAIRCASE LEADING", CR,
324                 324 "DOWN.", CR);
325                 326 7:
327                 328 WRITE ("IN A HIGH, SQUARE CAVE WITH", CR,
329                 329 "WALLS OF FROZEN ICE. THERE ARE", CR,
330                 330 "PASSAGES IN MANY DIRECTIONS, AND", CR,
331                 331 "A STAIRWAY LEADING UP.", CR);
332                 333 8:
334                 335 WRITE ("IN A TRIANGULAR SIDE-CHAMBER.", CR);
336                 337 9:
338                 339 WRITE ("IN A MUSTY-SNELLING ALCOVE.", CR);
340                 341 10:
342                 343 WRITE ("IN A EERIE CHAMBER - SMALL", CR,
344                 344 "SQUEALING SOUNDS COME FROM THE", CR,
345                 345 "WALLS.", CR);
346                 347 11:
348                 349 WRITE ("PASSING THROUGH AN ENORMOUS", CR,
350                 350 "CAVE WITH A DOUBLE PILLAR OF GREEN", CR,
351                 351 "STONE DOWN THE CENTRE. A BIG ARCH", CR,
352                 352 "LEADS NORTH AND DARK TUNNELS", CR,
353                 353 "LEADS FROM THE SOUTHEAST AND", CR,
354                 354 "SOUTHWEST CORNERS.", CR);
355                 356 12:
357                 358 WRITE ("CROUCHED IN A MALODOUROUS", CR,

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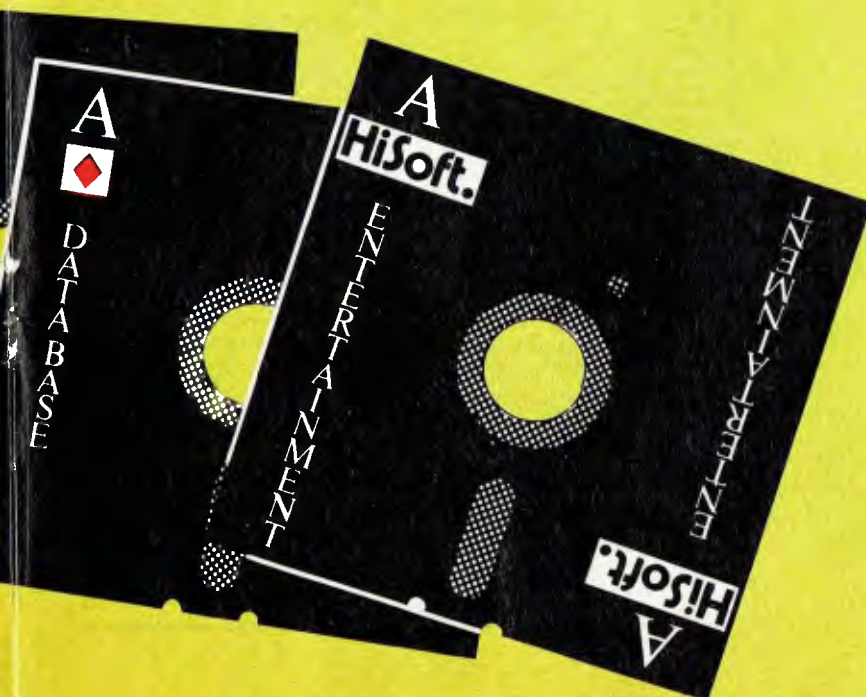
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```

359 "TUNNEL. THE ONLY EXIT IS THE",CR,
360 "WAY YOU CAME.",CR);
361
362 13:
363
364 WRITE ("A ROOM WHICH APPEARS TO",CR,
365 "ONLY HAVE AN EXIT IN THE NORTHWEST",CR,
366 "CORNER. HOWEVER YOU GET THE",CR,
367 "IMPRESSION THAT OTHERS HAVE",CR,
368 "SOMEHOW TRAVELLED ONWARDS THROUGH",CR,
369 "THIS ROOM - THE EXACT METHOD THEY",CR,
370 "USED IS NOT APPARENT.",CR);
371
372 14:
373
374 WRITE ("A SECRET ROOM REACHED ONLY",CR,
375 "BY MAGIC MEANS. A HIGH PASSAGE",CR,
376 "EXITS TO THE NORTHEAST.",CR);
377
378 15:
379
380 WRITE ("A DEPRESSING OCTAGONAL ROOM.",CR,
381 "EERIE PASSAGES LEAD NORTH AND",CR,
382 "SOUTHWEST.",CR);
383
384 16:
385
386 WRITE ("AN ENORMOUS MISTY CAVERN -",CR,
387 "THE ROOF IS SO HIGH THAT MIST",CR,
388 "OBSCURES IT.",CR,
389 "PASSAGES LEAD NORTH AND SOUTH.",CR);
390
391 17:
392
393 WRITE ("A TINY BOX-SHAPED ROOM. A",CR,
394 "DOOR LEADS SOUTH AND STAIRS LEAD",CR,
395 "DOWN.",CR);
396
397 18:
398
399 WRITE ("A BIZZARE ROOM WITH A SMELL",CR,
400 "OF CHLORINE. A PATH LEADS NORTH AND",CR,
401 "STAIRS LEAD UP.",CR);
402
403 19:
404
405 WRITE ("A STEAMY CHAMBER WITH WARM",CR,
406 "WALLS. FOOTSTEPS IN THE DUST SEEM",CR,
407 "TO LEAD WEST, AND COME FROM THE",CR,
408 "SOUTH.",CR);
409
410 20:
411
412 WRITE ("A LARGE ROOM, LITTERED WITH",CR,
413 "ALABASTER SLABS. DOORS LEAD EAST",CR,
414 "AND WEST.",CR);
415
416 21:
417
418 WRITE ("THE THRONE ROOM OF THE EVIL",CR,
419 "UR-LORD! A LOW DOOR LEADS EAST.",CR)
420
421 END; (* OF CASE *)
422
423   FOR I := 0 TO MAXOBJ DO
424     IF INROOM(I) THEN
425       WRITE (CR,"THERE IS A ",
426             DESCRIBEOBJECT(I),
427             " HERE!",CR)
428   END;
429   OLDROOM := ROOM
430 END;
431
432 PROCEDURE EAT;
433 BEGIN
434   IF GETOBJECT(NEARBY) THEN
435     IF OBJ = BUN THEN
436       BEGIN
437         WRITE ("THANKS! YOU WERE RATHER HUNGRY!",CR);
438         DESTROY(BUN)
439       END
440     ELSE
441       CRAZY
442 END;
443
444 PROCEDURE FORCE;
445 BEGIN
446   WRITE (
447     "AN INVISIBLE FORCE PREVENTS YOU FROM",
448     CR,"PASSING.",CR)
449 END;
450
451 PROCEDURE NOWAY;
452 BEGIN
453   WRITE ("YOU CANNOT GO THAT WAY.",CR)
454 END;
455
52

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556 PROCEDURE NORTH;
557 BEGIN
558   CASE ROOM OF
559     1:CRAZY;
560     2:ROOM := 1;
561     5:ROOM := 4;
562     6:ROOM := 5;
563     7:ROOM := 9;
564     11:ROOM := 7;
565     15:ROOM := 16;
566     16:IF CARRYING(RING) THEN
567       FORCE
568     ELSE
569       ROOM := 17;
570     18:IF CARRYING(STATUE) THEN
571       ROOM := 19
572     ELSE
573       FORCE
574     ELSE NOWAY END
575 END;
576
577 PROCEDURE SOUTH;
578 BEGIN
579   CASE ROOM OF
580     1:ROOM := 2;
581     4:ROOM := 5;
582     5:ROOM := 6;
583     9:ROOM := 7;
584     7:ROOM := 11;
585     16:ROOM := 15;
586     17:ROOM := 16;
587     19:IF CARRYING(STATUE) THEN
588       ROOM := 18
589     ELSE
590       FORCE
591     ELSE NOWAY END
592 END;
593
594 PROCEDURE EAST;
595 BEGIN
596   CASE ROOM OF
597     2:ROOM := 3;
598     3:ROOM := 4;
599     7:ROOM := 10;
600     8:ROOM := 7;
601     20:ROOM := 19;
602     21:ROOM := 20;
603     ELSE NOWAY END
604 END;
605
606 PROCEDURE WEST;
607 BEGIN
608   CASE ROOM OF
609     1:CRAZY;
610     3:ROOM := 2;
611     4:ROOM := 3;
612     10:ROOM := 7;
613     7:ROOM := 8;
614     19:ROOM := 20;
615     20:ROOM := 21;
616     ELSE NOWAY END
617 END;
618
619 PROCEDURE UP;
620 BEGIN
621   CASE ROOM OF
622     7:ROOM := 6;
623     18:ROOM := 17
624   ELSE NOWAY END
625 END;
626
627 PROCEDURE DOWN;
628 BEGIN
629   CASE ROOM OF
630     6:ROOM := 7;
631     17:ROOM := 18
632   ELSE NOWAY END
633 END;
634
635 PROCEDURE NORTHEAST;
636 BEGIN
637   CASE ROOM OF
638     12:ROOM := 11;
639     14:ROOM := 15
640   ELSE NOWAY END
641 END;
642
643 PROCEDURE NORTHWEST;
644 BEGIN
645   CASE ROOM OF
646     13:ROOM := 11
647   ELSE NOWAY END
648 END;
649
650 PROCEDURE SOUTHEAST;
651 BEGIN
652   CASE ROOM OF
653     12:ROOM := 13
654   ELSE NOWAY END
655 END;
656
657 PROCEDURE SOUTHWEST;
658 BEGIN
659   CASE ROOM OF
660     11:ROOM := 12;
661     15:ROOM := 14
662   ELSE NOWAY END
663 END;
664
665 PROCEDURE IN;
666 BEGIN
667   CASE ROOM OF
668     3:ROOM := 4
669   ELSE NOWAY END
670 END;
671
672 PROCEDURE OUT;
673 BEGIN
674   CASE ROOM OF
675     4:ROOM := 3
676   ELSE NOWAY END
677 END;
678
679 PROCEDURE WAVE;
680 BEGIN
681   IF GETOBJECT(CARRIED) THEN
682     IF OBJ = ROD THEN
683       BEGIN
684         CASE ROOM OF
685           13:ROOM := 14;
686           14:ROOM := 13
687         ELSE
688           WRITE ("NOTHING HAPPENS HERE.",CR)
689         END
690       END ELSE
691         WRITE ("WAVING THE ",SAYWORD(2),
692             " IS NOT VERY REWARDING!",CR);
693     IF ROOM <> OLDROOM THEN
694       WRITE ("THERE IS A BLINDING FLASH ",
695           "OF LIGHT",CR,"A LOUD ",
696           "BURPING NOISE, AND YOU ",CR,
697           "SUDDENLY FIND ...",CR,CR);
698   END;
699
700 PROCEDURE GIVESCORE;
701 BEGIN
702   SCORE := 0;
703   IF OBJECT(STATUE) = 1 THEN
704     SCORE := SCORE + 100;
705   IF OBJECT(RING) = 1 THEN
706     SCORE := SCORE + 100;
707   IF OBJECT(CROWN) = 1 THEN
708     SCORE := SCORE + 100;
709   IF CARRYING(STATUE) THEN
710     SCORE := SCORE + 10;
711   IF CARRYING(RING) THEN
712     SCORE := SCORE + 10;
713   IF CARRYING(CROWN) THEN
714     SCORE := SCORE + 10;
715   WRITE (CR,"YOUR SCORE IS ",
716       SCORE#," POINTS, IN ",
717       TURNS#," TURNS.",CR)
718 END;
719
720 PROCEDURE QUIT;
721 VAR REPLY: CHAR;
722 BEGIN
723   GIVESCORE;
724   WRITE (CR,"DO YOU WANT TO QUIT NOW? Y/N ");
725   READ (REPLY);
726   IF REPLY <> "Y" THEN
727     OK
728   ELSE
729     ROOM := 0
730   END;
731
732 PROCEDURE INVENTORY;
733 VAR I, COUNT: INTEGER;
734 BEGIN
735   COUNT := 0;
736   FOR I := 0 TO MAXOBJ DO
737     IF CARRYING(I) THEN
738       BEGIN
739         IF COUNT = 0 THEN
740           WRITE ("YOU ARE CARRYING:",CR);
741         COUNT := COUNT + 1;
742         WRITE (" ",DESCRIBEOBJECT(I),CR)
743       END;
744     IF COUNT = 0 THEN
745       WRITE ("YOU AREN'T CARRYING ANYTHING!",CR)
746     END;
747
748 PROCEDURE VERB;
749 VAR I: INTEGER;
750 BEGIN
751   WRITE (CR);
752   I := 1;
753   CASE WORD(1) OF
754     "GO", "RUN", "WAL", "MOV",
755     "CRA":
756     BEGIN
757       IF WORD(2) = 0 THEN
758         BEGIN
759           WRITE (SAYWORD(1)," WHERE?",CR);
760           I := 0
761         END ELSE
762           I := 2
763       END
764     END; (* CASE *)
765     IF I <> 0 THEN
766       CASE WORD(I) OF
767         "QUI", "Q": QUIT;
768         "EAT": EAT;
769         "NOR", "N": NORTH;
770         "SOU", "S": SOUTH;
771         "EAS", "E": EAST;
772         "WES", "W": WEST;
773         "NE": NORTHEAST;
774         "NW": NORTHWEST;
775         "SE": SOUTHEAST;
776         "SW": SOUTHWEST;
777         "UP", "U": UP;
778         "DOW", "D": DOWN;
779         "IN": IN;
780         "OUT": OUT;
781         "TAK", "T", "GET", "PIC":
782           TAKE;
783         "DRO", "PUT", "PLA", "THR":
784           DROP;
785         "SCO": GIVESCORE;
786         "INV", "I": INVENTORY;
787         "LOO", "L": LOOK;
788         "WAV": WAVE;
789         "INS": INSPECT
790       ELSE DONTUNDERSTAND END
791     END;
792
793 PROCEDURE INITIALIZE;
794 VAR I: INTEGER;
795 BEGIN
796   WRITE (HOME);
797   ROOM := 3;
798   OLDROOM := 0;
799   SCORE := 0;
800   HOLDING := 0;
801   TURNS := 0;
802   FOR I := 0 TO MAXOBJ DO
803     OBJECT(I) := 0;
804     OBJECT(LAMP) := 1;
805     OBJECT(BUN) := 6;
806     OBJECT(ROD) := 9;
807     OBJECT(RING) := 8;
808     OBJECT(STATUE) := 12;
809     OBJECT(CROWN) := 21;
810   END;
811
812 (* -----
813 PROGRAM STARTS HERE
814 ----- *)
815
816 BEGIN
817   INITIALIZE;
818   INSTRUCTIONS;
819   REPEAT
820     TURNS := TURNS + 1;
821     IF ROOM <> OLDROOM THEN
822       DESCRIBEROOM;
823     GETLINE;
824     VERB
825   UNTIL ROOM = 0;
826   WRITE (HOME);
827   GIVESCORE;
828   IF SCORE = 300 THEN WRITE
829     (CR,CR,"CONGRATULATIONS!!",CR,CR,
830     "YOU HAVE COMPLETED YOUR QUEST!",CR,CR)
831 END.

```


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Genetic Drift

By Jon Mears

MY CONTRIBUTION is a game for the 1K ZX81 called 'Genetic Drift'.

It is set in the year 2000 in a genetic engineering factory, the controls have gone crazy and all sorts of mutations are being produced. You have one chance to escape from these mutations.

The computer will draw the grid and show you the atoms you can use, then wait for three inputs. The first two are the co-ordinates, the last is the number of the atom you want to use. When you have created your molecule, type in 0, and the computer will evaluate the molecule and tell you if the genetic drift is safe or lethal.

If you have extra memory, then improvements to the program could include making a larger grid and using a larger range of atoms. The program is quite simple and will run on just about any other computer.

```
5 LET S=0
10 LET G=S
15 FOR F=1 TO 5
20 PRINT AT F,7;F;AT 7,F;F
25 NEXT F
30 LET A$="(GRAPHICS SHIFTED H)"
35 LET B$="0"
40 LET C$="I"
45 LET D$="-"
50 PRINT AT 10,0;A$;"=1,0=2,1=3,-=4"
55 INPUT A
60 IF A=0 THEN GOTO 120
65 LET S=S+A
70 INPUT B
75 LET S=S+B
80 INPUT C
85 LET G=G+C
90 IF C=1 THEN PRINT AT A,B;A$
95 IF C=2 THEN PRINT AT A,B;B$
100 IF C=3 THEN PRINT AT A,B;C$
110 IF C=4 THEN PRINT AT A,B;D$
115 GOTO 55
120 CLS
125 LET GD=S/G
130 PRINT "GENETIC DRIFT=";GD
135 IF GD<2.4 OR GD>2.9 THEN GOTO 150
140 PRINT "GENETIC DRIFT SAFE"
145 STOP
150 PRINT "GENETIC DRIFT LETHAL"
```

The Sinclair Clock

By K W Hince

HAVING read your article on writing for publication, I decided to give it a try. At the time I was writing a clock program for my ZX-81, and so I tidied it up a bit, wrote a few explanatory paragraphs, and here it is.

This 1K subroutine turns your ZX-81 computer into a 24 hour clock. The program works by counting the number of frames that have been displayed on the TV. Since the frame rate should be very close to 50 Hz, a reasonably accurate clock can be made by adding 1 second to every 50 frames.

In this program the time is displayed as a six digit number, with the hours, minutes and seconds being separated by a colon.

The subroutine itself consists of line 10 to 85. Since it is a subroutine — that is, it ends with a RETURN statement — lines 100-120 have been added to act as a calling program.

Note that there are only two entry points to the subroutine, one at line 20 where the clock has to be started or the time reset, and the other at line 45 where the time is to be updated. If you have entered the entire program exactly as it is printed here, then enter GOTO 100 to get things going.

You will be asked for the current time, which should be entered as a six digit number based on the 24 hour clock. For example, if the time is 20 seconds after 4.15 in the afternoon, then enter 161520.

The ZX-81 has a system variable called FRAMES (See page 179, ZX81 Manual). This variable starts out as 65,535 and is decreased by 1 every time a frame is sent to the TV. FRAMES goes down to 32,768, and then it starts again from 65,535. This makes a very handy reference for the clock, since every time FRAMES is decremented represents 1/50 second.

If you prefer a 12-hour display, change line 75 to:

```
75 IF VAL (STR$ N) (2 TO
3) >= 12 THEN LET
N=N-120000<
```

In running this program myself I noticed that it runs slightly fast, gaining about 10 seconds every half hour. This must be because the frame rate is slightly above 50Hz. You can compensate this by altering every occurrence of the constant '50' in lines 55 and 60.

Instead of 50, try 50.5 — experiment a little. If the clock runs fast, increase it, if slow, decrease

it. I ended up with 60.63. Another thing is that this routine must be run with the ZX in SLOW mode, because in FAST mode no frames are displayed on the TV.

Also you may not use PAUSE statements in any program that is relying on CLOCK, because PAUSE resets the FRAMES counter to the length of the pause. One last thing is that the actual position of the display on the screen can be moved anywhere you like simply by changing the two numbers following the 'AT' in line 80.

```
10 LET A=PEEK 16436+256*PEEK 16437
15 RETURN
20 PRINT "TIME ?"
25 INPUT N
27 CLS
30 LET N=N+1000003
35 GOSUB 10
40 LET B=A
45 GOSUB 10
50 IF B<A THEN LET B=B+32768
55 LET N=N+INT ((B-A)/50)
60 LET B=B-50*INT ((B-A)/50)
65 IF VAL (STR$ N) (6) >= 6 THEN LET N=N+40
70 IF VAL (STR$ N) (4) >= 6 THEN LET N=N+4000
75 IF VAL (STR$ N) (2 TO 3) >= 24 THEN LET N=N-240000
80 PRINT AT 0,24; (STR$ N) (2 TO 3);":";(STR$ N) (4 TO
5);":";(STR$ N) (6 TO )
85 RETURN
100 GOSUB 20
110 GOSUB 45
120 GOTO 110
```

Pontoon

By Chris Makowski

THIS IS a pontoon program written for the ZX81 with 16K RAM. The program is simple and easy to follow and can be used on any computer with a CLS (clear screen) statement and PRINT AT or TAB statement.

I have always liked the card game pontoon and I suppose most people do too, but sometimes it's hard to find someone to play a few games with so I sat down to write a pontoon game program for my ZX81 with 16K RAM.

To start the game you press run then enter, the computer will display 'YOUR CARDS' and the name of the game. To get the cards you press enter every time you want one.

When you have decided you do not want any more cards you press 'N' then enter; the computer's cards will be added to the screen and when it thinks it has enough cards it checks to see who has won.

The one who reaches a score of 5 wins, the computer will then display 'GAME OVER', the final score and an instruction on how to restart the game. Since the computer is dealing the cards it is therefore the banker and when an identical hand occurs for you and the computer, the computer wins.

When you get an Ace, you have the choice of making it a 1 or 11, to make it a 1 you press 'Q' then enter. To make it an 11 you press 'A' then enter. When you have done this and you still want more cards they will now be displayed under the 'ACE MESSAGE'. The computer will make its own decision about the Ace.

When a hand is over, the score will be added to the screen and the whole display will be paused for a few seconds before the screen is cleared to make room for another hand.

Happy 'Pontooning'.

```

1 LET P=0
2 LET S=0
10 LET E=0
20 LET G=0
30 LET I=0
40 LET K=0
45 LET L2=0
50 LET L5=0
55 LET M2=0
60 LET M4=0
65 LET M6=0
70 LET M8=0
72 LET Y=0
73 LET X=0
77 PRINT AT 0,10;"ZX81 PONTOON"
78 PRINT AT 1,10;"*****"
85 PRINT "YOUR CARDS"
90 INPUT B$
100 IF B$="Y" THEN GOTO 130
110 IF B$="N" THEN GOTO 525
130 LET A=INT (RND*13)+1
140 IF A=1 THEN GOTO 190
150 IF A=11 THEN GOTO 300
160 IF A=12 THEN GOTO 360
170 IF A=13 THEN GOTO 420
180 GOTO 490
190 PRINT " "; "ACE"
195 PRINT
196 PRINT
200 PRINT "DO YOU WANT YOUR ACE"
201 PRINT "TO = 1 OR 11"
210 PRINT "IF 1 PRESS Q IF 11 P"
220 PRINT "RESS R"
230 INPUT C$
240 IF C$="Q" THEN LET A=1
250 IF C$="R" THEN LET A=11
260 LET D=A
270 PRINT " "; D;
280 LET E=E+D
290 GOTO 2000
300 PRINT " "; "J";
320 LET F=10
340 LET G=G+F
350 GOTO 2000
360 PRINT " "; "Q";

```

Catch

By Paul A Barry

CATCH IS written for the ZX81 and is a game of judgement and skill but needs a bit of practice to get used to the controls.

You are controlled by: 6 to go down; and 7 to go up.

To start, simply type in RUN. The title 'CATCH' will appear on the screen and the game will commence. You have to catch a man's head as he is running across the screen with your 'J'.

You are the 'J' and the man is a 3 line high, star, inversed I and an M. If you miss the man don't panic; he will come back. Note that in the listing, lines 1-150 and 205, + means inversed character or characters.

```

1 PRINT AT 10,12;"CATCH+"
2 LET B=1
3 LET C=15
4 PAUSE 99
135 FOR J=1 TO 10
140 LET A=INT (RND*20)
145 FOR I=1 TO 29
150 PRINT AT A,B;"*"; AT A+1,B;"I+"; AT A+2,B;"M"; AT C,15;"J"
157 IF C=A AND B=15 THEN LET D=D+1
160 LET C=C+ (INKEY$="6")-(INKEY$="7")
162 LET A=A+1
165 CLS
167 NEXT I
170 LET B=1
200 NEXT J
205 PRINT AT 10,B;"YOUR SCORE WAS+",D
210 PAUSE 50
215 RUN

```



```

380 LET H=10
400 LET I=I+H
410 GOTO 2000
420 PRINT " "; "K";
450 LET J=10
470 LET K=K+J
480 GOTO 2000
490 LET L1=A
500 PRINT " "; L1;
510 LET L2=L2+L1
520 GOTO 2000
525 PRINT
526 PRINT
527 PRINT
530 PRINT "MY CARD"
540 LET N=INT (RND*13)+1
550 IF N=1 THEN GOTO 600
560 IF N=11 THEN GOTO 710
570 IF N=12 THEN GOTO 770
580 IF N=13 THEN GOTO 630
590 GOTO 690
600 PRINT " "; "ACE"
610 PRINT "DO YOU WANT YOUR ACE"
TO = 1 OR 11
620 IF Y<11 THEN LET A=11
640 IF Y>=11 THEN LET A=1
645 LET L4=A
650 PRINT " "; L4;
652 LET L5=L5+L4
655 GOTO 2090
710 PRINT " "; "J";
730 LET M1=10
750 LET M2=M2+M1
760 GOTO 2090
770 PRINT " "; "Q";
790 LET M3=10
810 LET M4=M4+M3
820 GOTO 2090
830 PRINT " "; "K";
850 LET M5=10
870 LET M6=M6+M5
880 GOTO 2090
890 LET M7=N
900 PRINT " "; M7;
910 LET M8=M8+M7
920 GOTO 2090
2000 LET X=E+G+I+K+L2
2010 IF X>21 THEN GOTO 2022
2020 GOTO 2050
2022 PRINT
2025 PRINT "PONTON YOU WIN"
2027 GOTO 3000
2050 IF X>21 THEN GOTO 2065
2060 GOTO 90

```

```

2065 PRINT
2070 PRINT " "; "ENTER I WIN";
2080 GOTO 3003
2090 LET Y=L5+M2+M4+M6+M8
2100 IF Y>21 THEN GOTO 2120
2110 GOTO 2140
2120 PRINT " "; "ALL 45 YOU WIN"
2130 GOTO 3000
2140 IF Y<17 THEN GOTO 540
2145 IF Y=21 THEN GOTO 2147
2146 GOTO 2150
2147 PRINT " "; "PONTON I WIN";
2148 GOTO 3003
2150 IF Y>17<=20 THEN GOTO 2190
2180 STOP
2190 IF X>Y THEN GOTO 2192
2191 GOTO 2200
2192 PRINT " "; "YOU WIN";
2193 GOTO 3000
2200 IF Y>X THEN GOTO 2202
2202 PRINT " "; "I WIN";
2203 GOTO 3003
2205 IF X=Y OR Y=X THEN GOTO 300
3
2210 STOP
3000 LET P=P+1
3001 GOTO 3006
3003 LET S=S+1
3005 GOTO 3058
3008 PRINT AT 2,22;"SCORE"
3009 PRINT AT 3,21;"HE FRED"
3020 PRINT AT 4,22:P
3030 PRINT AT 4,26:S
3032 FOR T=1 TO 55
3033 NEXT T
3038 CLS
3039 IF P<5 THEN GOTO 10
3040 PRINT "GAME OVER"
3041 PRINT AT 0,15;"SCORE"
3042 PRINT AT 1,14;"HE FRED"
3045 PRINT AT 2,14:P
3046 PRINT AT 7,2;"DO YOU WANT A"
NOTHER GAME? IF YOU DO PRESS
RUN THEN ENTER."
3047 STOP
3058 PRINT AT 2,22;"SCORE"
3059 PRINT AT 3,21;"HE FRED"
3061 PRINT AT 4,26:S
3065 PRINT AT 4,22:P
3070 FOR U=1 TO 55
3072 NEXT U
3080 CLS
3090 IF S<5 THEN GOTO 10
4000 GOTO 3040

```

SYSTEM 80

Overlay

By L Wiggins

WHILE writing a bank accounting program on my System 80 I decided I needed a routine that would allow me to have headings and/or instructions at the top and bottom of the screen but still scroll through information in the centre of the screen.

What I ended up with was a routine that 'Overlays' previously presented data.

The program can be divided up into 6 sections:

- LINE 10 set pointer to 0
- LINE 15 This sets the offset value for screen positioning. This line can be deleted and the re-

quired value included in line 40.

- LINE 16 This is limited to an integer value between 1 and 16. This sets the number of lines displayed before overlaying occurs. This can be deleted if the number of lines required is known by substituting them into lines 30 and 50.

- LINE 20 Sets For and Next loop.

- LINES 30 and 50 These lines calculate the next print position on the screen. The successful operation of the program depends on the way Microsoft BASIC handles floating point to integer conversion; that is, the integer value of 1.9 is returned as 1.

- LINE 40 Print command sets up position on the screen. The

```

10 CLS : PO=0
11 PRINT "SCREEN OVERLAY ROUTINE"
12 PRINT "OFFSET : DESIGNATES START POSITION ON SCREEN"
13 PRINT "LINES : NUMBER OF LINES FOR SCROLLING RANGE"
15 INPUT "INPUT OFFSET"; OF
16 INPUT "INPUT NO OF LINES"; LR
17 OF=INT(OF)
18 LR=INT(LR)
19 CLS
20 FOR N= 1 TO 100
30 N1=(N-1)-PO*LR
40 PRINT@ OF+(N1*64),"OVERLAY";
45 PRINT N1+1;; PRINT N;
50 PO=INT(N/ LR)
60 NEXT
70 GOTO 70

```

expression PRINT@ OF+(N1*64), 'xxx'; is necessary only in the first print position as others on the line will follow.

The length of the For and Next loop is limited only by the computer as long as the loop starts at 1.

The routine within its limits is quite handy where on-screen handling of data is required. □

Classroom Computers

By Brian Fowler

WHILE there are many programs published for game playing and for the small businessman, there are very few published to help teachers.

The few that do appear are usually related to CAI (Computer Assisted Instruction) and not for the business side of the classroom.

The program described here should help rectify the imbalance. It is one I have used on an Apple II to work out results at the end of a term and can be used at the primary, secondary or tertiary level.

A deliberate attempt has been made to avoid machine specific coding so that it can be adapted to any computer with a minimum of modification.

The program is designed to allow letter grades (from A+ to C- for passing grades, D or F for failures) to be awarded for each of a number of tests or essays during the term and that each test or essay will have a different weighting in the final mix of marks.

The resultant printout provides the name of each student together with a notional percentage score, an equivalent letter grade, an indication whether they have failed any part and finally a list of the individual letter grades that were put in.

This latter listing enables the teacher to check the grades put in against his mark book if necessary. Listing 2 shows this for an imaginary set of 10 students who had 5 pieces of assessment during the term. After all the students have been individually graded a set of statistics is produced.

The Program Listing

Line 30 allows you to enter in the number of individual items of assessment used during the term (note Arrays A, B and C can be adjusted to cope with more than 15 items if necessary) whilst the section from lines 60 to 110 is used to load array A with the weighting of each assessment item.

Note that the following section

from 120 to 170 tells you if the allotted weightings do not add up to 100 percent and allows you to re-enter the weightings.

The section from 280 to 340 allows the individual student's letter grades to be entered. Each score is then transformed to a number, multiplied by the appropriate weighting, progressively totalled and any failure is flagged (at I\$).

A progressive tally is kept in array B (Line 1300) of the number of scores at each level of each assessment item. After all the letter grades are entered, the weighted average score and letter grade are determined in lines 400 to 530 and printed in line 602.

The Summary

The first part of the summary (Lines 640-670) gives the number of students which achieved each level of the final grade.

The second part of the summary (Lines 680-720) is derived from array B to print out the number of students getting each grade within each question and the notional average grade for each question. This part of the summary is useful for comparing the relative difficulty of the various items of assessment and their ability to discriminate between students. Finally the overall class average is printed.

This program is designed to be run once at the end of the term or semester.

A copy of the program is available from Brian Fowler, School of Education, Darling Downs Institute of Advanced Education, C/- Post Office, Darling Heights, Queensland, 4350. If you wish a copy for Apple II computers, send a cassette or formatted (3.3 DOS) disk and a stamped addressed envelope.

```

10 HOME
15 PRINT "MARKING SYSTEM FOR LETTER GRADES"
18 INVERSE
20 PRINT : PRINT "TURN PRINTER ON NOW"
25 NORMAL : PRINT : PRINT
30 INPUT "NO. OF ASSESSMENTS=";D
35 REM INITIALISE ARRAY
38 DIM C(15)
40 DIM A(15): DIM B(15,25)
41 FOR K = 1 TO D
42 FOR X = 0 TO 20
43 B(K,X) = 0
45 NEXT X
50 NEXT K
55 PRINT
60 PRINT "WHAT IS WEIGHTING OF EACH ASSESSMENT"
70 PRINT "AS % OF TOTAL?": PRINT
80 FOR K = 1 TO D
90 PRINT "ASSESSMENT NO. ";K: INPUT B
100 B1 = B1 + B: A(K) = B
110 NEXT K
120 IF B1 = 100 THEN 190
130 PRINT : PRINT : INVERSE
140 PRINT "WARNING"
145 PRINT "TOTAL MARKS MORE THAN 100% !"
148 NORMAL
150 PRINT : PRINT "IF YOU WISH TO RE-ENTER TYPE 'R'"
160 PRINT "OTHERWISE PRESS <RETURN>"
170 INPUT A$: IF A$ = "R" THEN 60
190 PRINT : PRINT
200 INPUT "NO. OF STUDENTS=";N
205 PR# 0: REM DISCONNECTS PRINTER
207 PRINT : PRINT
210 PRINT "ENTER STUDENT NAMES AND GRADES"
212 FOR I = 1 TO N
215 PRINT : PRINT " (LIMIT NAMES TO 12 LETTERS)"
230 T = 0: I$ = " "
240 PRINT : PRINT
250 INPUT "NAME=";A$
260 PRINT
270 PRINT "INPUT GRADES FOR ";A$
275 PRINT : PRINT
280 FOR K = 1 TO D
290 PRINT "ENTER GRADE #";K;
295 INPUT B$
300 GOSUB 1000
310 C = X + W + 0.05
320 T = T + C: C = 0
340 NEXT K

```




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APPLE

```

400 IF T > 84.5 THEN 510
410 IF T < 65.5 THEN 435
430 G$ = "B":T2 = T2 + 1: GOTO 600
435 IF T < 50 THEN 530
440 GOTO 520
450 T2 = T2 + 1: GOTO 600
510 G$ = "A":T1 = T1 + 1: GOTO 600
520 G$ = "C":T3 = T3 + 1: GOTO 600
530 G$ = "F":T4 = T4 + 1: GOTO 600
595 PRINT : PRINT
600 PR# 2: REM TURN ON PRINTER
602 PRINT A$; TAB( 15)"AV=";T;" GRADE=";G$;" (" ;I$;" ) ";
595 FOR K = 1 TO Q
606 C$ = "F"
607 IF C(K) = 20 THEN C$ = "A+": GOTO 618
608 IF C(K) = 19 THEN C$ = "A": GOTO 618
609 IF C(K) = 18 THEN C$ = "A-": GOTO 618
610 IF C(K) = 16 THEN C$ = "B+": GOTO 618
611 IF C(K) = 15 THEN C$ = "B": GOTO 618
612 IF C(K) = 14 THEN C$ = "B-": GOTO 618
613 IF C(K) = 12 THEN C$ = "C+": GOTO 618
614 IF C(K) = 11 THEN C$ = "C": GOTO 618
615 IF C(K) = 10 THEN C$ = "C-": GOTO 618
616 IF C(K) = 7 THEN C$ = "D": GOTO 618
617 IF C(K) = 5 THEN C$ = "D-": GOTO 618
618 PRINT " ";C$;
619 NEXT K
620 PRINT : PR# 0
622 T8 = T8 + T
630 NEXT I
635 PR# 2
640 PRINT : PRINT : PRINT : PRINT : PRINT "SUMMARY"
650 PRINT "*****": PRINT : PRINT
655 PRINT "NO. OF STUDENTS WITH EACH FINAL GRADE"
660 PRINT "A=";T1;" B=";T2;" C=";T3;" F=";T4
670 PRINT : PRINT
680 PRINT "SUMMARY OF EACH ASSESSMENT": PRINT
695 FOR K = 1 TO Q
697 PRINT "ASST. #";K
698 PRINT "WEIGHTING = ";A(K);"%".
702 X = 0:T6 = 0:T7 = 0
705 PRINT "0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+"
712 PRINT B(K,0); TAB( 4)B(K,5);
      TAB( 7)B(K,7); TAB( 10)B(K,
      10); TAB( 13)B(K,11); TAB( 1
      6)B(K,12); TAB( 19)B(K,14); TAB(
      22)B(K,15); TAB( 25)B(K,16);
      TAB( 28)B(K,18); TAB( 31)B(
      K,19); TAB( 34)B(K,20)
713 FOR X = 1 TO 20
715 T6 = T6 + (X * B(K,X))
720 NEXT X
725 T7 = T6 * 5 / N
730 PRINT "ASST. AUGE=";T7;"%": PRINT : PRINT
745 NEXT K
750 T9 = T8 / N
760 PRINT : PRINT
770 PRINT "CLASS AVERAGE=";T9;"%"
772 PRINT : PRINT

```

```

990 PR# 0
999 END
1000 IF B$ = "A+" THEN X = 20: GOTO 1250
1010 IF B$ = "A" THEN X = 19: GOTO 1250
1020 IF B$ = "A-" THEN X = 18: GOTO 1250
1030 IF B$ = "B+" THEN X = 16: GOTO 1250
1040 IF B$ = "B" THEN X = 15: GOTO 1250
1050 IF B$ = "B-" THEN X = 14: GOTO 1250
1060 IF B$ = "C+" THEN X = 12: GOTO 1250
1070 IF B$ = "C" THEN X = 11: GOTO 1250
1080 IF B$ = "C-" THEN X = 10: GOTO 1250
1090 IF B$ = "D" THEN X = 7: GOTO 1200
1100 IF B$ = "D-" THEN X = 5: GOTO 1200
1150 INVERSE : PRINT "WARNING"

```

```

1160 PRINT "MARK OUTSIDE A - D RANGE": NORMAL
1165 PRINT "IF YOU WISH TO RE-ENTER MARK TYPE 'R'"
1168 PRINT "OTHERWISE PRESS <RETURN>"
1170 INPUT RM$: IF RM$ = "R" THEN 1176
1173 GOTO 1190
1176 PRINT "ENTER GRADE #";K
1178 INPUT B$
1180 GOTO 1000
1190 X = 0
1200 I$ = "F"
1250 W = A(K)
1300 B(K,X) = B(K,X) + 1
1310 C(K) = X
1400 RETURN

```

ADAMS R	AV=86.25	GRADE=A ()	A A B B+ A-
BARTLETT W	AV=73	GRADE=B ()	C B A C B
CAMPBELL W	AV=21.75	GRADE=F (F)	C- D F C F
DENT Q	AV=75.5	GRADE=B ()	B B B+ B- B
EDWARDS O	AV=70	GRADE=B ()	A C- C B B-
FRENCH T	AV=55	GRADE=C ()	C C C C C
GRAHAM N	AV=47.5	GRADE=F (F)	C F D B C
HORN S	AV=80	GRADE=B ()	A B C B A
INDER T	AV=69.75	GRADE=B ()	B A C A+ C
JONES W	AV=96.25	GRADE=A ()	A A+ A A+ A

SUMMARY

NO. OF STUDENTS WITH EACH FINAL GRADE
A=2 B=5 C=1 F=2

SUMMARY OF EACH ASSESSMENT

ASST. #1
WEIGHTING = 20%
0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+
0 0 0 1 3 0 0 2 0 0 4 0
ASST. AUGE=74.5%

ASST. #2
WEIGHTING = 10%
0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+
1 0 1 1 1 0 0 3 0 0 2 1
ASST. AUGE=65.5%

ASST. #3
WEIGHTING = 25%
0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+
1 0 1 0 4 0 0 1 1 0 2 0
ASST. AUGE=60%

ASST. #4
WEIGHTING = 15%
0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+
0 0 0 0 3 0 1 3 1 0 0 2
ASST. AUGE=74%

ASST. #5
WEIGHTING = 30%
0..0-.0..C-.C..C+.B-.B..B+.A-.A..A+
1 0 0 0 3 0 1 2 0 1 2 0
ASST. AUGE=66.5%

CLASS AVERAGE=67.5%

Hex/Decimal Conversion

By 'REB' of Burwood

PROFESSIONAL programmers would probably find this too simple and short; however, I am sure many readers would be at my standard, and be able to make use of it.

While learning to use an Apple computer (Applesoft in ROM) I found that looking up tables or using a pocket calculator for hex-

adecimal conversion was tedious and time consuming.

Surely a small program would simplify this chore. After many revisions, this is the program that evolved. It is a simple and short program, so modification to suit different brands of computer should be possible. □

```

100 POKE 34,0: HOME : CLEAR
110 INVERSE : PRINT " DECIMAL TO HEXADECIMAL CONVERSION " :
    PRINT " HEXADECIMAL TO DECIMAL CONVERSION " : NORMAL :
120 PRINT : PRINT "TO CHANGE A DECIMAL NUMBER"; TAB(30)"TYPE
    ' D '": PRINT : PRINT "FOR THE HEXADECIMAL NUMBER"; TAB
    (30)"TYPE ' H '": PRINT : PRINT "TO CONTINUE , USE THE";
    TAB(30)"SPACE BAR": PRINT : PRINT "ANY OTHER KEY WILL END":
    PRINT :
130 PRINT "=====": POKE 34,12
140 GOSUB 430
150 GET A$
160 IF A$ = CHR$(68) THEN A = 1: GOTO 200
170 IF A$ = CHR$(72) THEN A = 2: GOTO 200
180 IF A$ = CHR$(32) THEN GOTO 200
190 POKE 34,0: HOME : PRINT : PRINT : PRINT "      F I N I S H
    ": PRINT : PRINT "      * * * * * ": END
200 ON A GOTO 210,290
210 PRINT "GIVE DECIMAL NUMBER - THEN KEY RETURN":
    PRINT:INPUT D:
220 D = INT (D): IF ABS (D) >= 65536 THEN
    PRINT : PRINT : GOTO 210
230 IF D < 0 THEN D = 65536 + D
240 M = FN Q1(D): GOSUB 340: HTAB (25): PRINT M$;
250 M = FN Q2(D): GOSUB 340: PRINT M$;
260 M = FN Q3(D): GOSUB 340: PRINT M$;
270 M = FN Q4(D): GOSUB 340: PRINT M$;
280 PRINT "      =====":
    PRINT : GOTO 150
290 PRINT "GIVE FOUR FIGURE HEXADECIMAL NUMBER":
    PRINT "LEADING ZEROS IF NEEDED": PRINT :
300 GET H$: PRINT H$;: GOSUB 330:W = H * 4096:
    GET H$: PRINT H$;: GOSUB 330:W = W + H * 256:
    GET H$: PRINT H$;: GOSUB 330:W = W + H * 16:
    GET H$: PRINT H$;: GOSUB 330:W = W + H: HTAB (25): PRINT W;
310 PRINT "      =====": PRINT
320 GOTO 150
330 Z = - 2
340 RESTORE
350 FOR K = 0 TO 15
360 READ N,N$
370 IF M = N THEN M$ = N$
380 IF H$ = N$ THEN H = N:Z = - 5
390 NEXT
400 IF Z = - 2 THEN INVERSE : PRINT :

```

```

PRINT "      E R R O R      ": PRINT : NORMAL
410 RETURN
420 DATA 15,F,14,E,13,D,12,C,11,B,10,A,9,9,8,8,7,7,6,6,5,5,
    4,4,3,3,2,2,1,1,0,0
430 DEF FN Q1(D) = INT (D / 4096): DEF FN Q2(D) =
    INT ((D - FN Q1(D) * 4096) / 256)
440 DEF FN Q3(D) = INT ((D - (FN Q1(D) * 4096 +
    FN Q2(D) * 256)) / 16): DEF FN Q4(D) = D - (FN Q1(D)
    * 4096 + FN Q2(D) * 256 + FN Q3(D) * 16)
450 RETURN
460 REM THIS PROGRAMME WAS      DEvised
    BY ' REB ' OF      BURWOOD 27TH MARCH 1982.

```

Apple Calendar

By Geoff W Black

THIS IS a program I have written for the Apple II computer which creates and draws up any calendar for any year (within certain limits), and if a printer is 'on line' then the program will reproduce it on the printer.

The program has a built-in a date calculator to determine the day of the date or to calculate the number of days between two dates.

The program has provision for a cartoon to be printed on the printer with every calendar.

Provision is made for the user to add to the program a 'text size reduction' code (if available on the printer being used) to 'shrink' the calendar.

The width of the printer is assumed to be 64 characters or greater and is assumed the printer is connected through slot 1 of the computer.

The user has the option of printing the calendar onto the screen or the printer and because of the inadequate size of the Apple's screen (24 by 40 characters), only six months of the year can be viewed at any one time.

Therefore the program does not use a 'screen dumping' method to regenerate the calendar onto the printer; a different printing format is used. □

APPLE

```
1 REM *****
2 REM * CALENDAR CALCULATOR *
3 REM *
4 REM * BY GEOFF W. BLACK 1982 *
5 REM *****
20 DIM A(12),A$(12),J(12),W$(7),D(3)
25 REM INITIALISE
30 GOSUB 2000
34 REM *****
35 REM * MENU *
36 REM *****
40 TEXT : HOME : VTAB 9: PRINT TAB(10): INVERSE : PRINT "CALENDAR CAL
  CULATOR": NORMAL
50 PRINT : PRINT TAB(7): "BY GEOFF W. BLACK 1982"
55 PRINT
60 PRINT "INPUT:": PRINT
62 PRINT " YYY -YEAR"
64 PRINT
65 PRINT " YYY -HARD COPY (PRINTER)"
67 PRINT
70 PRINT " X -DATE CALCULATOR MODE"
71 PRINT
73 PRINT " S -STOP"
80 PRINT : INPUT "":A$: IF A$ = "X" THEN 900
85 IF A$ = "S" THEN STOP
90 C = VAL(A$): IF C < 1582 OR C > 9999 THEN 40
100 HOME :K = 1:J = 3:E = 0: IF MID$(A$,LEN(A$),1) < > "P" THEN GOSUB
  630
109 REM *****
110 REM * FIND 1ST DAY OF YR *
111 REM *****
120 FOR Q = 1582 TO C STEP 100:J = J - 1: IF J = 0 THEN J = 7
130 NEXT Q:Q = Q - 100: FOR M = Q TO C: IF E = 1 THEN 160
140 IF INT(M/4)*4 = M THEN E = 1
150 GOTO 200
160 J = J + 1: IF J = 8 THEN J = 1
170 E = 0
200 J = J + 1: IF J = 8 THEN J = 1
230 NEXT M:Z = J:M = 0
240 IF MID$(A$,LEN(A$),1) = "P" THEN 1300
290 G = 6
295 STOP
300 IF G < 6 THEN G = 6
305 IF G = 6 THEN 330
310 HOME :K = 1: GOSUB 630
319 REM *****
320 REM *PRINT DAY HEADINGS*
322 REM *****
330 FOR Q = 1 TO 3: VTAB 8 + (Q - 1) + 2: FOR R = 1 TO 7:A$ = W$(R):A$ =
  LEFT$(A$,2): IF Q = 3 AND R = 7 THEN 380
360 PRINT A$: GOTO 390
380 PRINT A$:
390 NEXT R,Q
400 FOR M = 1 TO G: IF G = 12 AND M < 7 THEN 610
410 A$ = A$(M):A = A(M)
440 IF INT(C/4)*4 = C AND M = 2 THEN A = 29
450 K = INT((M - 1)/2): IF M > 6 THEN K = INT((M - 7)/2)
470 VTAB 8 + K + 1:X = 2: IF INT(M/2) + 2 = M THEN X = 23
490 X = 2: IF INT(M/2) + 2 = M THEN X = 23
500 INVERSE : POKE 36,X + 4: PRINT A$: NORMAL
505 REM *****
510 REM *PRINT DATE NUMBERS*
515 REM *****
62
```



```

530 FOR N = 1 TO A: VTAB 8 * K + 1 + J: POKE 36,X: IF N < 10 THEN PRINT
    " ";
580 PRINT N:J = J + 1: IF J < 8 THEN 600
590 J = 1:X = X + 3
600 NEXT N
610 NEXT M
620 K = 0
630 INVERSE : VTAB 12: POKE 36,19: PRINT "YEAR": POKE 36,19: PRINT C: NORMAL
    : IF K = 1 THEN RETURN
640 VTAB 15: POKE 36,19: INPUT "":B$: HOME : IF M > 10 THEN J = 2
645 IF B$ = "X" THEN 900
650 IF B$ < " " THEN 670
660 IF G = 12 THEN 290
665 G = 12: GOTO 300
670 A$ = B$: GOTO 85
675 C = VAL (B$): IF C < 1582 OR C > 9999 THEN 40
680 IF C > 1581 THEN 100
800 DATA "SUNDAY", "MONDAY", "TUESDAY", "WEDNESDAY", "THURSDAY", "FRIDAY", "SATURDAY"
810 DATA "JANUARY",31,"FEBRUARY",28,"MARCH",31,"APRIL",30
820 DATA "MAY",31,"JUNE",30,"JULY",31,"AUGUST",31
830 DATA "SEPTEMBER",30,"OCTOBER",31,"NOVEMBER",30,"DECEMBER",31
900 REM *****
902 REM * DATE CALCULATOR *
903 REM *****
905 HOME : VTAB 12: PRINT TAB( 10):: INVERSE : PRINT "DATE CALCULATOR"
910 NORMAL
920 PRINT : PRINT " 1- NO. OF DAYS BETWEEN DATES"
930 PRINT : PRINT " 2- DAY OF DATE"
935 PRINT : PRINT " 3- RETURN"
940 VTAB 20: INPUT "OPTION #":A$:A = VAL (A$)
942 IF A < 1 OR A > 3 THEN 900
945 HOME :D = 0
950 IF A = 3 THEN 40
960 INPUT "ENTER DATE: (DD-MM-YYYY) ":A$
965 IF LEN (A$) < > 10 THEN 960
970 IF A = 2 THEN 1000
980 PRINT : INPUT "2ND DATE: ":B$
990 IF LEN (B$) < > 10 THEN 980
1000 HOME
1010 D = VAL ( LEFT$ (A$,2)):M = VAL ( MID$ (A$,4,2)):Y = VAL ( RIGHT$
    (A$,4))
1050 GOTO 1100
1060 D = VAL ( LEFT$ (B$,2)):M = VAL ( MID$ (B$,4,2)):Y = VAL ( RIGHT$
    (B$,4))
1100 D = D + 1
1110 F(0) = 365 * Y + D + 31 * (M - 1) + INT ((Y - 1) / 4) - INT (.75 *
    ( INT (((Y - 1) / 100) + 1)))
1120 IF M < 3 THEN 1140
1130 F(0) = 365 * Y + D + 31 * (M - 1) - INT (.4 * M + 2.3) + INT (Y /
    4) - INT (3 / 4 * ( INT (Y / 100) + 1))
1140 IF D = 2 THEN 1200
1150 IF A = 1 THEN 1060
1160 DW = F(1) + 7 + INT ( - F(1) / 7) * 7
1170 RESTORE : FOR M = 1 TO DW: READ C$: NEXT M
1180 PRINT A$: " ": C$
1190 GOTO 940
1200 A = ABS (F(1) - F(2)):C$ = "": IF A > 1 THEN C$ = "S"
1210 PRINT A:" DAY":C$:" BETWEEN": PRINT A$:" & ":B$
1220 GOTO 940
1300 REM *****
1305 REM * PRINTER *
1306 REM *****

```

APPLE

```
1310 PR# 1
1315 GOSUB 3000
1320 PRINT TAB( 22); "**** CALENDAR   ":C;" ****"
1330 IF INT ( C / 4 ) * 4 = C THEN A(2) = 29
1340 J(1) = J
1350 FOR M = 2 TO 12
1360 K = J(M - 1):L = A(M - 1)
1370 X = L - 28 + K
1380 IF X > 7 THEN X = X - 7
1390 J(M) = X
1400 NEXT M
1410 K = 0:Z = 0
1420 FOR M = 1 TO 4
1430 PRINT
1435 REM * PRINT MONTH *
1440 FOR N = 0 TO 2
1450 K = K + 1
1455 A1 = K2 + Z2
1460 A$ = A$(K):K2 = LEN (A$):Z2 = 11 -
      INT (K2 / 2)
1465 IF N = 2 THEN PRINT SPC( 22 - A1 + Z2);
1470 IF N < 2 THEN HTAB N * 22 + Z2
1475 PRINT A$:
1480 NEXT N: PRINT
1485 REM * PRINT DAY HEADINGS *
1490 FOR N = 0 TO 2:D(N) = 1
1510 FOR P = 1 TO 7
1520 PRINT LEFT$ (W$(P),2); " ";
1530 NEXT P
1535 PRINT " ";

1540 NEXT N
1545 PRINT
1550 REM * PRINT DATES *
1555 FOR W = 1 TO 6
1560 FOR N = 0 TO 2
1580 FOR P = 1 TO 7
1590 L = J(K - 2 + N):D = D(N)
1595 IF L < > P THEN 1675
1600 IF D > A(K - 2 + N) THEN 1675
1610 IF D < 10 THEN PRINT " ";
1620 PRINT D;" ";
1630 D(N) = D(N) + 1
1640 J(K - 2 + N) = L + 1
1650 IF L < 7 THEN 1680
1660 J(K - 2 + N) = L - 6
1670 GOTO 1685
1675 PRINT " ";
1680 NEXT P
1685 PRINT " ";
1690 NEXT N
1693 PRINT
1695 NEXT W
1700 REM ?
1705 NEXT M
1715 FOR M = 1 TO 15: PRINT : NEXT M
1717 PR# 0
1720 REM * JOB COMPLETE *
1750 GOTO 90
2000 REM *****
2003 REM * INITIALISE *
2004 REM *****
```

TRS80 MODEL III

Tandy Calendar

By T J Carlsen

THIS program has been written for use with a TRS-80 Model III; unfortunately I have no idea whether it would be compatible with a Model I, or what changes are necessary to get it running on other brands.

Basically the program is an (almost) perpetual calendar, using inkey routines and with output to either VDU or printer. The printer routines are for an Epson and may need changing for other brands.

This could easily be done by altering the value of the variable Z7 in line 50 to CHR\$(73) (or any other suitable character — depending on the particular printer).

As I have only had my computer for just over three months, I am very much a novice at programming, so doubtless there may be better ways of doing this! However the routines may prove interesting for someone in a similar position.

```
10 CLS: CLEAR 500: DEFINT A-L: DEFSTRM-Z: GOSUB 1180: GOSUB 1370
20 PRINT Z1;: Q(1) = "CALENDAR FOR ANY YEAR FROM 1-9999 A.D."
30 Q(2) = CHR$(239) + " 1982 BY T.J. CARLSEN"
40 Q(3) = "PORT HEDLAND WA"
50 Q(4) = "PRESS <ENTER> TO CONTINUE": Q(5) = "ENTER"
60
70 : Print details and centre in square
80
90 E=415: FORC=1 TO 4: IFC=4 THEN C1=C1+B*2
100 LS=E+C1-LEN(Q(C))/2: PRINT@LS, Q(C): C1=C1+B: NEXT
110 PRINT Z1;: CF=729: GOSUB 1070
120
130 : Input section
140
150 RESTORE
160 CLS: PRINT "ENTER YEAR REQUIRED   ": EC=48: ER=57: L=5: GOSUB
170
180 B1=VAL(R1): IF B1<1 THEN CLS: PRINT "YEAR MUST BE OVER 1 A.D."
190 : FORC=1 TO 700: NEXT: GOTO 160
180 YR=R1
190 CLS: PRINT "WHICH MONTH IS REQUIRED (ENTER 'ALL' IF FULL YEAR
REQUIRED)": EC=65: ER=89: L=4: GOSUB 950
200 PRINT: TI=RIGHT$(R1,3)
210
220 : Convert abbrev. to full month and test for validity
230
240 FOR I=1 TO 12: READ T,D: IF LEFT$(T,3)=T THEN TI=T
250 IFTI=T THEN 280
260 NEXT: RESTORE
270 IFTI<>"ALL" THEN 190
280 CLS: RESTORE: PRINT "DO YOU WANT RESULTS TO <P>RINTER OR
<S>CREEN ?"
290 Q1=INKEY$: 'Clear latchkey
300 PS=INKEY$: IF PS="" THEN 300
310 IF ASC(PS)<>BO AND ASC(PS)<>B3 THEN 300
320
330 : Determine day of week to start the year
340
350 CLS: B3=(B1-1)/100: B5=(B1-1)/400
360 B4=(B1-1)/4: C1=B1-B3+B4+B5
370 C1=(C1/7-INT(C1/7))*7+.1
380
390 : Find length of each month and print details
400
410 FOR I=1 TO 12: READ T,D
420 IF B1/400-INT(B1/400)=0 THEN 440 '400 year leap year
430 IF B1/100-INT(B1/100)=0 THEN 450 'Turn of century non leap
year
440 IF B1/4-INT(B1/4)=0 AND T="FEBRUARY" THEN D=29 'Leap year
450 IFTI="ALL" THEN 480
460 IFT<>T THEN 420
470 FL=1 'Flag to indicate that required month has been done
```



```

2005 FOR M = 1 TO 19: READ A$
2010 IF M > 7 THEN 2050
2020 W$(M) = A$
2030 GOTO 2070
2050 READ A(M - 7)
2060 A$(M - 7) = A$
2070 NEXT M
2080 RETURN
3000 REM PICTURE DRAWING
3010 HOME
3050 RESTORE
3100 FOR M = 1 TO 71: IF M < 32 THEN READ A$: GOTO 3130
3110 READ A:B
3113 IF K = 15 OR K = 39 OR K = 17 OR K = 37 OR K = 35 THEN PRINT SPC(
A - Y): GOTO 3120
3115 PRINT TAB( A + 14):
3120 FOR N = 1 TO B - A: PRINT "#": NEXT
3124 X = A:Y = B
3125 K = M - 31: IF K < > 15 AND K < > 35 AND K < > 17 AND K < > 37 AND
K < > 39 THEN 3127
3126 GOTO 3130
3127 PRINT
3130 NEXT
3500 DATA 30,30,28,30,27,30,26,31,25,31,25,31
3510 DATA 24,30,23,29,23,26,23,25,22,24,22,22
3520 DATA 12,12,9,17,8,18,29,33,7,19,27,35
3530 DATA 5,38,4,39,3,38,3,37,3,36,2,34,1,33
3540 DATA 1,33,1,34,1,35,1,36,1,37,2,37,3,36,5,34
3550 DATA 6,33,8,17,20,31,9,15,23,30,11,12,25,27
3999 RETURN

```

```

480 IFPS="P" THEN 750 ' Output to printer
490 IFC1=0 AND D=28 THEN AP=BESEAP=10
500 GOSUB 1320
510 '
520 ' Find print position for each day and print day
530 '
540 I3=C1:IP=263+C1*8
550 FOR I2=1 TO D:PRINT@IP,USING"##";I2:I3=I3+1:IF I3=7 THEN 570
560 IP=IP+8:NEXT:GOTO 620
570 I3=0:IP=IP+80:IF IP>820 THEN IP=263
580 NEXT
590 '
600 ' Calculate starting point for next month
610 '
620 C1=C1+D-28:IF C1>=7 THEN C1=7
630 IF FL<>1 AND TI="ALL" THEN 640 ELSE IF FL<>1 THEN NEXT I ' More
months?
640 PRINT@979,Q(4):CP=986:GOSUB 1100
650 IF TI="ALL" THEN NEXT I ' Next month
660 CLS:PRINT"DO YOU WANT ANY OTHER YEARS CALCULATED?":FL=0
670 Q1=INKEY$: ' Clear latchkey
680 Q=INKEY$:IF Q=" " THEN 680
690 IFASC(Q)<>7 AND ASC(Q)<>89 THEN 680
700 IF Q="Y" THEN 150
710 END
720 '
730 ' Line printer output
740 '
750 GOSUB 920 :LPRINTZ7:TAB(21):TAB(31):B1:TAB(56):Z7
760 LPRINTZ7:FOR I5=1 TO 55:LPRINT"-":NEXT I5:LPRINTZ7
770 LPRINTZ7:" SUN ";Z7:" MON ";Z7:" TUE ";Z7:" WED "
:Z7:" THU ";Z7:" FRI ";Z7:" SAT ";:GOSUB 930
780 C=0:IF C1=0 THEN 800
790 FOR H1=1 TO C1:LPRINTZ7:" ";:C=C+1:NEXT H1
800 FOR I1=1 TO D:LPRINTZ7:LPRINTUSING" ## ";I1:
810 C=C+1:IF C<>7 THEN 840
820 GOSUB 920
830 IF I1<>D THEN C=0
840 NEXT I1
850 IFC=7 THEN 880
860 FOR H1=1 TO 7-C:LPRINTZ7:" ";:NEXT H1
870 GOSUB 930
880 GOSUB 920
890 CP=857:PRINT@850,Q(4):GOSUB 1100
900 C1=C1+D-28:IF C1>=7 THEN C1=7
910 IF FL=1 THEN 660 ELSE NEXT I
915 GOTO 660
920 FOR I5=1 TO 57:LPRINT"-":NEXT I5:LPRINT:RETURN
930 LPRINTZ7:LPRINTZ7:FOR I5=1 TO 7:LPRINT"-----":Z7:NEXT I5
LPRINT:RETURN
940 DATA JANUARY, 31, FEBRUARY, 28, MARCH, 31, APRIL, 30, MAY, 31, JUNE,
30, JULY, 31, AUGUST, 31, SEPTEMBER, 30, OCTOBER, 31, NOVEMBER, 30,
DECEMBER, 31

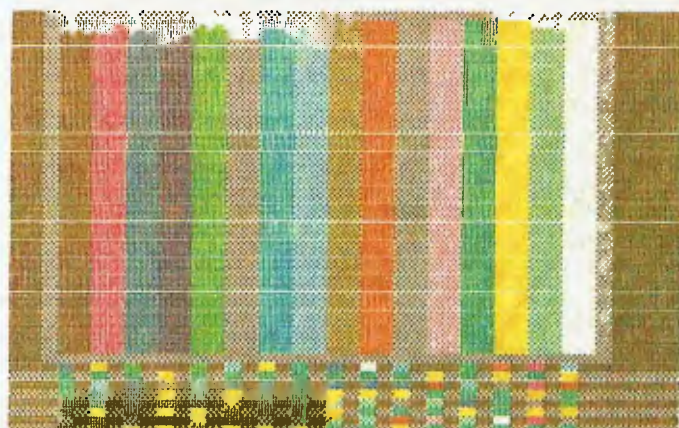
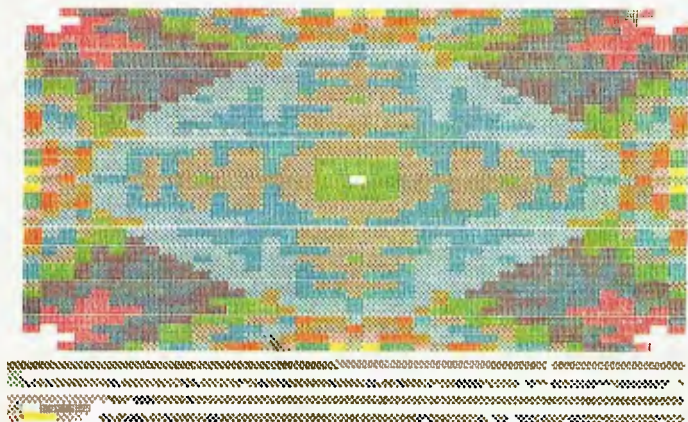
```

```

950 '
960 ' Inkey routine
970 '
980 RI=" ":Q1=INKEY$: ' Clear latchkey
990 Q=INKEY$:IF Q=" " THEN 990
1000 IFASC(Q)=13 THEN 1060
1010 IFASC(Q)=BANDLEN(RI)=1 THEN 990
1020 IFASC(Q)<>8 THEN 1040
1030 RI=LEFT$(RI,LEN(RI)-1):PRINTCHR$(8):GOTO 990
1040 IFASC(Q)<ECORASC(Q)>ER THEN 990
1050 PRINTQ:RI=RI+Q:IF LEN(RI)<>L THEN 990
1060 RETURN
1070 '
1080 ' Flashing "ENTER" routine
1090 '
1100 Q1=INKEY$: ' Clear latchkey
1110 Q=INKEY$:PRINT@CP,STRING$(5,128):FORC=1 TO 100:NEXT
1120 PRINT@CP,Q(5):FORC=1 TO 100:NEXT
1130 CA=CA+1:IF CA>10 THEN 1150
1140 IF Q<>" " THEN 1160 ELSE 1110
1150 Q=INKEY$:IF Q=" " THEN 1150
1160 CA=0:IFASC(Q)<>13 THEN 1100
1170 RETURN
1180 '
1190 ' Initialize display strings
1200 '
1210 Z1=CHR$(21):Z2=CHR$(131):Z3=CHR$(176):Z4=CHR$(179):
Z5=CHR$(191):Z6=CHR$(128):Z7=CHR$(124)
1220 P1=STRING$(7,128):P2=STRING$(7,188):P3=STRING$(7,143):
P4=STRING$(7,140)
1230 S1=STRING$(46,179):S2=Z5+Z6+Z5+STRING$(44,128)+Z5+Z6+Z5
1240 A=198:B=64
1250 PA=Z5:FORC=1 TO 7:PA=PA+P3+Z5:NEXT
1260 PB=Z5:FORC=1 TO 7:PB=PB+P1+Z5:NEXT
1270 PC=Z5:FORC=1 TO 7:PC=PC+P4+Z5:NEXT
1280 PD=Z5:FORC=1 TO 7:PD=PD+P2+Z5:NEXT:RETURN
1290 '
1300 ' Print calendar chart
1310 '
1320 CLS:PRINT@67,PA:FORC=1 TO APSTEP2:PRINT@C*8+67,PB:
PRINT@C+1)*8+67,PC:NEXT
1330 PRINT@67+C*8,PB:PRINT@67+(C+1)*8,PD:
1340 PRINT@134,"SUN":PRINT@142,"MON":PRINT@150,"TUE":
PRINT@158,"WED":PRINT@166,"THU":PRINT@174,"FRI":
PRINT@182,"SAT":
MY$=T+" "+4*YR
1350 PRINT@32-LEN(MY)/2,MY:RETURN ' Centre month heading
1370 '
1380 ' Draw square
1390 '
1400 PRINT@A,Z5:Z2:S1:Z2:Z5:
1410 FORC=1 TO 8:PRINT@A+8*C,S2:NEXT
1420 PRINT@A+B*C,Z5:Z3:S1:Z3:Z5:RETURN

```


A Case For Colour



As you've probably noticed, the latest development to hit the personal computer in a big way is colour. The only drawback is that there's no way to get colour hard copy. Until recently, that is.

EVER SINCE THE Apple II was released, the definition of a good personal/home computer has been revised to include a colour display capability.

There's no doubt colour has several advantages. It makes games much more interesting, enables display of new kinds of graphics such as pie charts, and can draw attention to different areas of a display such as alarms, and so on.

In particular, commercial users are becoming more aware of the potential of colour graphic displays for communicating business data. For so many years, the printed word has benefitted from attrac-

your computer



tive colour presentation.

Many companies would never dream of sending their shareholders such a basic document as an annual report without dressing it up in colour to assist interpretation (or colour it, if you'll excuse the pun) — yet they hamper themselves by dull

presentation of analytical data which requires considerable interpretation before it can be understood.

The use of a personal computer is changing that in many companies. For example, sophisticated financial analysis packages such as Micromodeller now incorporate the ability to generate colour graphics as standard, so that bar charts comparing actual against budget, for example, can be immediately plotted. That brings home the message much more than a dull dry printout can.

The only problem is that to reexamine the plots, the computer must be fired up and the display set up again. Some printers offer black and white graphics capability, but until now there has been no way of dumping a colour display to a printer.

The machine that changes this is the CASE CX-80 colour printer. Only slightly larger than the well-known MX-80, the CX-80 uses a coloured ribbon to print both text and graphics in six colours plus black.

IBM PERSONAL COMPUTER



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The CX-80 is a fairly weighty machine for its size, and this suggests a pretty rugged construction. It is also quite fast when printing text in one of its primary colours — 150 characters per second. Unfortunately, the primary colours are yellow, magenta and cyan, and none of them is really dark enough for easy reading. In any case, the CX-80 is not the kind of printer one uses for ordinary program listings, and so on.

The printer actually builds up the secondary colours by using multiple passes over the paper to overprint and mix the inks. By this means, six colours plus black (and by implication, white) are achievable, as shown in Table 1.

The colours are quite pure, with accurate registration of the second and third passes. This means that the different coloured dots are printed directly over each other, with no sideways slipping.

Printing multiple passes over the same line obviously slows the printer down, which is why it has such a high single-colour speed in the first place. In practice, the speed is quite adequate.

Even considered as a normal printer, the CX-80 has some outstanding features. The character set is neat and easily readable (though it lacks lower case descenders, and can optionally be printed in double width. The characters are formed on a 5 by 7 dot matrix. Both character (horizontal) and line (vertical) spacing are variable, and reverse characters (white on 'black') are possible.

The character set includes full upper and lower case, with all the standard ASCII punctuation and other symbols; it also includes PET graphics characters. Up to 15 characters are user programmable for such applications as mathematical (Greek) characters or simple graphics.

Colour can be changed at any stage, including between characters, simply by sending ASCII control characters.

But it is in the dot-addressable mode that the CX-80 really shines, and this is what it was designed for. In this mode, the seven vertical hammers which print a line of dots on the paper are individually controllable as the print head moves across the paper.

Because of the encoding scheme used by the CX-80, the data for the seven dots has to be split into two parts — one part holds the data for the top four dots and the other has the data for the lower three. Most users will form the data in a single variable or memory location, and will need a subroutine to break the data into two halves and add the necessary offsets for the printer. The CX-80 manual gives an example:

```
1000 PRINT CHR$(X AND 7) + 48);
      CHR$(INT(X/8) + 64);
1010 RETURN
```

68

Decimal	Colour
1	Red
2	Green
3	Yellow
4	Blue
5	Magenta
6	Cyan
7	Black

Table 1. CX-80 colours.

Of course, you still have the problem of forming the dot pattern in the memory location in the first place, but that depends very much upon your application.

If an Apple owner, of course, you can buy a special high resolution colour dump card for the CX-80. This allows screen dumps to the printer at any time, either under program control or initiated by the user at the keyboard.

The card is a standard size Apple plug-in, and is as easy to install as any other kind of printer interface. It is supplied with a cable for the CX-80. Once the card has been initialised with a PR#1 command (for example), it is ready for use.

Commands to the colour dump card are preceded by a control-I character, while all other characters pass straight to the printer. Alternatively, the control prefix can be changed from control-I to another

n	Dump	Reversal?	Sc
1	Full graphics	black=black	1
2	Full graphics	black=black	2
3	With text	black=black	1
4	With text	black=black	2
5	Full graphics	black=white	1
6	Full graphics	black=white	2
7	With text	black=white	1
8	With text	black=white	2

Table 2. Apple dump modes and screens.

character and back again, for special situations. This is most useful when listing programs which contain embedded control characters, to stop them fouling up the listing.

The interface can be set to 7 or 8 bits, so that it will work with the CX-80 or any other Centronics interface printer.

The string control-InLm will start a low-res screen dump, where n is the number of spaces to be printed to shift the picture to the right of the page and m is the mode and screen as shown in Table 2. Similarly, the command control-InHm will start a high-res screen dump.

The command control-InDm will start a double-width high-res screen dump, which will be printed sideways to fit on the page.

Specifications and Report Card

Unit:	Case CX-80 colour printer
Made By:	Integrex Ltd, Burton-on-Trent, UK
I/O:	parallel, RS-232C, IEEE 488, current loop, View data
Languages:	works with any
Graphics:	programmable characters and dot-addressable graphics in six colours plus black
Best Points:	Colour Graphics
Worst Points:	None really — does everything claimed for it.

Ratings:	excellent	very good	good	poor
Documentation:			✓	
Ease of Use:			✓	
Functionality		✓		
Support:			✓	
Value-for-money:		✓		
Extras Included:	Apple screen dump card			
Options:	Various interfaces			
Price:	\$1990 plus sales tax (\$226.36).			
Review Unit from:	CASE Communication Systems Ltd, 1-3 Atchison St, St Leonards, NSW 2065. Tel (02) 438 2400.			

These screen dumps are remarkably good, and some examples can be seen at the beginning of this article (although the clash of the Case's dot-pattern with our colour-printing screen *may* deaden their appearance a little).

As well as explaining the use of the card from Applesoft and Integer BASICs, the manual for the dump card also includes examples of driving routines written in Apple Pascal. Off the top of my head, I'd say there's probably no reason why the card

wouldn't work with a Z-80 Softcard and CP/M as well.

The manuals for both the printer and the Apple screen dump card are very good. The printer manual includes examples of using the programmable character set and the dot addressable graphics, as well as the more mundane details such as the interface pinout and timing. There's also full instructions on changing the ribbon and the paper.

Additional interfaces are available for

the CX-80, including buffered RS-232C, IEEE 488, current loop and Viewdata, so there is no excuse for not being able to interface the printer to any computer.

The CX-80 is an interesting peripheral which will find wide application in professional microcomputer systems. It's probably not worth using it just to print outstanding amounts on statements in red, but it is certainly very useful for making computer-generated charts and diagrams much more readable.

Here's A Big Itoh...

C. Itoh seems to release a new printer every few weeks these days. Its latest unit, the 1550, offers very high performance...

JUST WHEN you think you've got it made, something spoils it. I remember a fantastic feeling of relief when I first got my Epson MX-80...I would be able to work with proper listings, not scribbles copied from the CRT.

These days, what seemed like a lightning-fast 80 characters per second is interminably slow, and the 80 characters width, which seemed able to hold any line of code I could possibly write, now wraps around illegibly under the strain of my long Pascal lines. *C'est la vie!*

There must be a large number of people like me out there, who have had a smaller printer for quite some time, and are now looking for something both wider and faster. For such people, the Itoh 1550 would have to merit serious consideration. That's not to say it's not worth checking out for traditional applications such as accounting, as it certainly is.

The 1550 looks somewhat similar to the 8510, which was reviewed in YC's December '81 issue, and there appear to be some parts in common. That's not a bad thing, as the 8510 is a very good printer. It's quite light, at only 11 kgs, as well as compact (55 by 30 by 13 cm).

The 1550 accepts paper from 11cm wide up to 39cm. Either conventional fan-fold, rolled or single sheet paper can be used.

Incidentally, it is interesting to note that many printers coming out of Japan will accept single sheets, as the dot matrix is becoming more and more acceptable for correspondence. I doubt that we shall ever see the end of the daisy wheel (or thimble), at least until really cheap and reliable ink jet printers arrive, but the acceptability of dot matrix is opening up the possibility of word-processed cor-

respondence for many new users.

Top speed on the 1550 is 120 characters per second, or 39 lines per minute of full 136 column print. The character set is based upon a 9 x 7 dot matrix, while an 8 by 8 set is available. The printer also has a bit addressable graphics capability.

Several pitches are possible, ranging from 17 characters per inch (230 columns) in compressed font to 5 characters per inch (68 columns) in double width pica pitch. The characters can be proportionally spaced, making for a particularly pleasing effect, and the vertical line spacing can be altered in 144ths of an inch.

The ribbon is a cartridge type for easy replacement, and on the floor of the print head area is a pair of DIP switches allowing selection of the various options on the machine.

Six special character sets are available to cater for the various kinds of accents required in different languages, and the zero symbol can be printed with or without a slash.

Other special features include underlining, forward and reverse line feeds (allowing printing of superscripts and subscripts), and the ability to automatically repeat print characters (to draw a line of asterisks, for example).

The page length can be set at either 66 or 72 characters by switch, and the machine set up to supply automatic line feeds after carriage returns or when the print buffer is full. Character pitch at power-up can be set to either 10 cpi or proportional spx,K. Interestingly, the 1550 can be set up to either print bidirectionally with logic seeking, or alternatively

Specifications and Report Card

Unit:	C. Itoh 1550 dot matrix printer			
I/O:	Centronics parallel as standard, RS-232C option			
Graphics:	high resolution dot addressable			
Best Points:	good print quality, compact			
Worst Points:	Documentation			
Ratings:	excellent	very good	good	poor
Documentation:				✓
Ease of Use:			✓	
Functionality		✓		
Support:		✓		
Value-for-money:		✓		
Options:	RS-232C interface			
Price:	\$1199 plus tax.			
Review Unit from:	Ampex Electronics, 1a Wellington St, Rozelle, NSW			

to print each character as it is received. As is the case with many modern printers, there is a whole range of possible commands which are rarely used, mainly because microcomputer software isn't as smart as the printers.

For example, the 1550 allows the left margin to be dynamically set, up to 32 horizontal tabs to be set at one time and includes an electronic vertical format unit that allows all kinds of wonderful things to be done if one has the patience to figure it all out. Actually, vertical format units aren't

used all that often, even on the big chain printers that first started them.

The bit image graphics are fairly easy to program after some experiment. Regrettably, the manual is rather deficient in this area, with statements like 'The number of bit image transmission data bytes is specified by the data of the data of the 6th bytes'.

The front panel has the usual array of switches and lights to move to the top of form, perform a line feed and switch on and off line. Indicator lamps show power,

paper empty and on-line conditions.

With the optional serial interface, the printer can use any of several protocols such as XON/XOFF, ETX/ACK or alternatively may use a hand-wired data ready/busy (DTR) system.

The general impression one receives of this printer is that it is very well made. There aren't funny rattles or thumps in operation, and everything seems well machined. It is fairly quiet in operation, and seems to be able to run at quite a high duty cycle. □

Anadexia Nervosa?

A few years back, in the printer industry, a new boy appeared on the block. Now well established, Anadex has earned a reputation for a high quality product at an excellent price.

OVER THE last couple of years, quite a few people we know have bought Anadex printers, and they all swear by them as reliable and great value for money (is this condition of addiction to one's printer known as Anadexia Nervosa?). So it was with interest that we examined the new DP-9501A model.

The DP-9501A is one of Anadex's new line of Silent/Scribe printers, which are designed with low noise in mind.

This is particularly important for printers attached to personal computers; in the old days, computers and their printers were hidden away in airconditioned rooms which provided an adequate degree of noise suppression — today, they're out in the middle of the office where everyone can see and hear them.

The Silent/Scribe series encompasses several sizes and speeds of printers. The two smaller members of the family, the DP-9000A and DP-9001A, can handle paper up to 20cm in width, while the 9500A and 9501A handle paper up to 33cm wide. All can print at speeds up to 200 characters per second, depending upon the character size in use.

The DP-9501A is not a small printer, at 68cm wide by 40cm deep and just over 21 high. For its size it's quite light, at 17.25 kg. The case is made of some form of glass-reinforced plastic, which has the advantage of being fairly dead acoustically, while the mechanism has a solid metal base.

Two character widths are possible; either 7 by 9 or 11 by 9. There is also a selection of character spacing, at either 10, 15 or 16.7 characters per inch.

Taking The Short Cut

The 9501A can print up to 220 columns in its most dense mode. Printing is bidirectional, with logic seeking so that the print head always takes the shortest path.

The Silent/Scribe family of printers feature both parallel (Centronics style) and serial interfaces as standard, and the serial interface can optionally be set up for all manner of XON/XOFF protocols (DEC type is standard) as well as STX/ETX.

The internal switches in the DP-9501A allow a variety of different options to be set up. These include the standards such as auto line feed, truncate/wrap around and selection of serial or parallel interface.

An interesting feature on the Anadex printers is the ability to print any data in the

buffer if no data has been received for 7.5 seconds. An annoying problem with some printers is the presence of data in the buffer at the start of printing a new form — this gets round that problem neatly.

The Silent/Scribe series include a vertical format unit as standard, which allows vertical tab stops to be set, although most microcomputer software makes no use of this kind of feature.

The DP-9501A supports graphics by sending one data byte to control the six print wires as they print a vertical line. Each graphics byte sent will have the most significant bit set high, and each of the remaining bits will cause one of the print wires to strike the paper if that bit is a one.

Specifications and Report Card

Unit:	Anadex DP-9501A dot matrix printer			
Made By:	Anadex, Chatsworth, California			
I/O:	both serial and parallel interfaces			
Graphics:	high density dot addressable			
Best Points:	Graphics, quiet			
Worst Points:	N/A			
Ratings:	excellent	very good	good	poor
Documentation:	✓			
Ease of Use:		✓		
Functionality		✓		
Support:		✓		
Value-for-money:		✓		
Price:	\$1899 plus sales tax.			
Review Unit from:	Datascape International Pty Ltd, 33 Grosvenor St, Neutral Bay, NSW 2089. Tel (02) 909 1233.			

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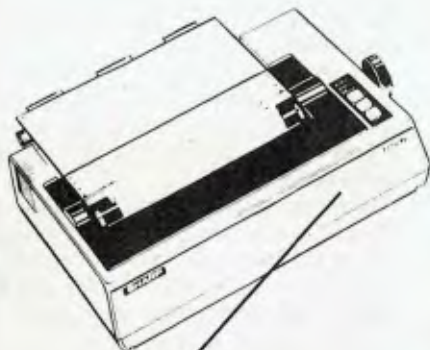
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Printer (CE-332P)

Kind of character: 176 kinds (ASCII, symbols, artificial graphic patterns).
Number of copies: 3 copies (including an original). Max 0.2mm.
Paper width: 101.6mm-254mm (4"-10").
Printing speed: 80 lines/minute.
Printing capacity: 80/132 character/line intelligent.
Power source: AC local voltage, 50/60Hz.
Operating temperature: 5°-35°C (41°-95°F).
Dimensions: 374(W) × 305(D) × 107(H)mm
14²³/₃₂"(W) × 12"(D) × 4⁷/₃₂"(H).
Weight: 5.5kg (12.1 lb).



Commands

User definable key set.
Up to 20 keys of constants and statements can be defined.

Specifications

Program language: BASIC.
Calculation capacity: Integer: -32767~32767.
Real number: Mantissa part 12 figures. Exponent part -99~+99.
Memory PC-3201: ROM 32K bytes (max 72K bytes).
RAM 64K bytes (optional expansion inside the board feasible up to max 112K bytes).
Electronic keyboard: 92 keys (ASCII, data entry, definable, function).
Editing debugging: Step sculpture, 64K input buffer.
Power source: Cursor control, left, right, home, insertion, deletion.
AC local voltage, 50/60Hz.
Power consumption: 40W (max).
Operating temperature: 0°-40°C (32°-104°F).
Dimensions: 450(W) × 350(D) × 100(H)mm
17²³/₃₂"(W) × 13²³/₃₂"(D) × 3¹⁵/₁₆"(H).
Weight: 5.0kg (11.02 lb).



Floppy Disk Drive — 8"

Memory capacity: 2MEG.
Number of tracks: 77 2D/S D/D.
Number of sectors: 26 sectors/track.



Floppy Disk Drive — 5"

Memory capacity: 560K, 2 drives.
Number of tracks: 35 tracks/side (2 sides/disk).
Number of sectors: 16 sectors/track.
Operating temperature: 10°-35°C (50°-95°F).
Power source: AC local voltage, 50/60Hz.
Outer dimensions: 189(W) × 334(D) × 184(H)mm.
7¹/₁₆"(W) × 13³/₃₂"(D) × 7¹/₄"(H).
Weight: 7.1kg (15.6 lb).

Monitor (CE-320C)

Screen size: 30cm (12") green monitor.
Kind of character: Letters (capital and small), symbols, artificial graphic patterns.
Display capacity: 80 characters × 25 lines.
Display structure: 6 × 8 dot matrix.
Operating temperature: 0°-40°C (32°-104°F).
Power source: AC local voltage 50/60Hz.
Dimensions: 325(W) × 315(D) × 278(H)mm
12²⁵/₃₂"(W) × 12¹/₃₂"(D) × 10¹/₁₆"(H).
Weight: 9.1kg (20.06 lb).

— and as for Software:

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High Resolution

The graphics is of quite high resolution, with good repeatability. One feature that is lacking is the ability to print alphanumerics and graphics on the same line — alphanumerics must be terminated with a carriage return before graphics mode is entered.

Each graphics line must be followed by an ASCII 1 through 9, which will cause the paper to advance vertically that number of dot positions. Horizontal 'tabbing' is possible by sending the sequence 'nnn', where nnn is an ASCII number.

The DP-9501A manual is excellent; in fact it's the best printer manual we've

seen.

It includes comprehensive information on installation, operation and maintenance, and typical of attention to detail is the inclusion of example programs written in Applesoft BASIC to demonstrate how the graphics mode is driven. An excellent section covers troubleshooting. □

We're Gonna Make You A Star

What the world needs now is a good, under-\$50 printer. As several manufacturers work towards producing one, perhaps the best value around is the Star DP-8480...

FOR MANY microcomputer owners, particularly hobbyists and programmers, there is no need for a particularly complex or sophisticated printer. Basically, their need is for a low-cost printer which can be used for program listings and the odd bit of printed output.

Such users have no need for graphics, wide selections of typefaces or high speed. Their printer will not be running all the time, and so does not need the same kind of mechanical ruggedness required for heavy duty commercial applications.

Consequently, there's a large market for a low-cost machine and the Star Manufacturing Co. of Japan has set out to capture it with the Star DP-8480 printer.

The Star is not the most prepossessing piece of hardware we've seen; it is bereft of many of the high-technology Concorde-style control panels seen on top-line printers. Nonetheless, it prints, quite reliably, doesn't take up much space, does the job and is easy on the wallet.

There are six kinds of Star DP-8480: either friction or tractor feed, each with Centronics, RS-232C or IEEE-488 interface. You can tell which is which by the last two letters of the type number — a DP-8480TR has a tractor feed with RS-232C interface, for example.

The friction type is designed to accept rolls of paper, and an optional roll holder is available.

The 8480 is, like many Japanese printers, based upon two separate microcomputers. The main processor is an Intel 8035, which handles I/O and overall operation, while a 'slave' 8041 controls two stepper motors for print head movement and paper feed.

Because of this amount of intelligence, the 8480 is quite a smart printer. It prints bidirectionally, with logic seeking to move the print head the shortest possible dist-

ance, at a speed of 80 characters per second. The character pitch is 1/10th inch with six lines to the inch (printers evidently haven't been metricated yet).

The print buffer is rather large, at 6 Kbytes compared to most printers' 2 or 3 K, and it can be further extended to 8K. Use of special escape sequences will allow up to 2K to be stored in the buffer, and only printed when an ESC Y is sent.

The character set is quite neat, although there are no descenders on lower-case characters. Characters are formed in a 7 by 9 dot matrix, and three different print widths are possible — 80, 96 and 132 characters per line. In each of these modes, double width printing is possible, giving another set of character sizes.

The ribbon is a 1/2 inch open reel type, rather than the cartridge type which is becoming more common on printers; this is

not as convenient (inky fingers) but more expensive.

A pre-defined graphics set is built into the printer. These characters are set up on a 6 by 6 matrix, and in the graphics mode the printer only operates unidirectionally.

The printer seems to be quite well made; I wouldn't want to run it 24 hours a day in a commercial computer centre, but it would certainly work well for any hobbyist or light commercial application.

The manual suffers from the usual Jenglish ('Get down the sheet retainer to fix the sheet position'), but is quite useable. Anyway, it can be fun finding these things out for yourself...

All in all, the Star printer offers very good value for money, and would certainly be suitable for program development and other light applications. □

Specifications and Report Card

Unit:	Star 80-column printer
Made By:	Star Manufacturing Co.
I/O:	Centronics parallel
Languages:	international
Graphics:	Pre-programmed graphics characters
Best Points:	low, low cost

Ratings:	excellent	very good	good	poor
Documentation:				✓
Ease of Use:			✓	
Functionality		✓		
Support:		✓		
Value-for-money:	✓			
Price:	\$565			
Review Unit from:	Delta Semiconductor Peripherals			



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Making business decisions you need all the help you can get. You need to absorb and evaluate huge amounts of data.

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like FORTRAN, COBOL, PASCAL, CB-80, PL/I-80, BT-80 and BASIC. The Okidata has the full backup of MiniMicro Supermart. We can help you with the hardware, the packaged and custom software and the professional advice that has given us one of the best reputations in the microcomputer industry. So stop thinking in black and white. Give us a call and find out how computing in colour can help you.

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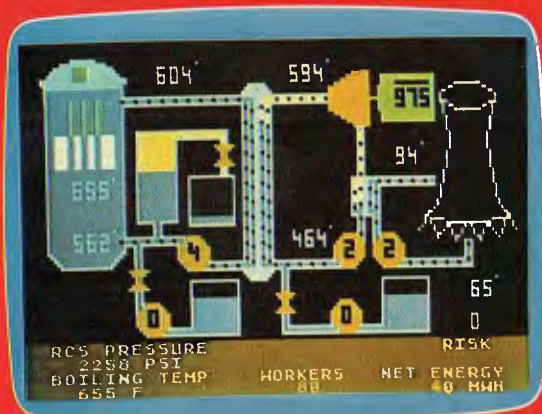
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CONCORD P/7282

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your computer text file

Cocky Computers

I READ with interest the article on Farmplan programs (*Your Computer*, November). I would appreciate further information on Farmplan.

I have been asked by some farmer friends to set up a program for them, but if a reasonably useful one is available I won't bother continuing.

PETER OLSEN
Wynnum, Qld

Farmplan's address is 64 McNamara Street, Orange, NSW 2800.

Two-Line Scroller

I AM pleased to see you have devoted a page to the ZX80.

I'm a 15-year-old ZX80 owner. I recently developed a two-line BASIC program for moving graphics on the 4K ROM (well, they look like they move!).

The program prints "Sinclair ZX80" repeatedly, in a scroll fashion.

```
1 REM SINCLAIR ZX80 BASIC SCROLL
2 POKE 16453,72
```

When the program is typed in, type 0 POKE 16426,0 on the edit line.

Run the program; an error code 0/2 will appear on the screen. Hit "New Line", turn the vertical hold on your television until the picture moves clearly.

Note: You cannot "break" out of this program, you must turn the computer off.

PETER FINN
Winston Hills, NSW

Gads, An Error!

ANDREW Koch's Renumber program for the TRS-80 has a flaw — it will not renumber after a RESUME statement.

I suggest lines

```
01128 CP 09FH
01129 JP Z,FOUND 1
```

should be added.

A second fault is that it will mess up embedded (non-standard) strings.

A third fault, which is minor and perhaps will encourage programmers to use standard BASIC, is that it will not renumber after implied GOTOs, as in:

```
IF A = 1, 15 or
IF A = B%15.
```

The TRS Model 1 will treat the comma as a GOTO, and the lack of any reserved word after B% as an implied GOTO. This fault need not be fixed, since people who use non-standard features should be aware of the risks.

ROD WORLEY
Glen Waverley, Vic

Hewlett Hints Please

DOES your magazine (or has your magazine) intend to publish any details, programs, tips, and so on for the Hewlett Packard HP-85 microcomputer?

T R JONES
Tatura, Vic

Somebody has to write 'em, if we're going to publish 'em! Any ideas?

Atari Appiness

CONGRATULATIONS on your new Atari column in the April 1982 issue. I was glad to see an Australian magazine giving some recognition to the most versatile personal computer available, when lo and behold, the column was missing from the May issue (so naturally I didn't buy it). Why was this so?

For the benefit of other readers, I must point out a slight error in the first column. There are actually 9 colours in Graphics 10 in any hue/luminance combination, not 5 as stated.

The hardware has made this possible by utilising the 4 player-missile colour registers which are 'shadowed' at addresses 704 to 707 decimal. (The shadow registers for the normal playfield colours are located at addresses 708 to 712 and correspond to SETCOLOR 0 to SETCOLOR 4 respectively.) The extra colours are located using POKE statements.

The value of POKE is easily calculated from the formula: $COL_OUR = HUE * 16 + LUMINANCE$; where HUE and LUMINANCE are the second and third parameters of the normal SETCOLOR statement and the same value limitations apply (HUE is from 0 to 15 and LUMINANCE is an even number from 0 to 14).

For example, POKE 704,182 sets the colour of the Player 0 colour register to light green. The COLOR statement is then used to select the desired colour register as usual. In GRAPHICS 10, this may be anything from COLOR 0 to COLOR 8 to select the colour contained in addresses 704 to 712 respectively. Note also that the background colour in GRAPHICS 10 is specified by the contents of address 704, whereas most of the other modes use the contents of address 712.

The following program applies the above principles to display 9 colours in GRAPHICS 10. The data statements may be changed to allow any colour combinations.

```
10 GRAPHICS 10:POKE 704,14
20 FOR I=1 TO 8:READ A:
   POKE 704+IA,COLOR I
30 FOR X=I*10-10-1:PLOT
   X,0:DRAWTO X,191
40 NEXT X:NEXT I
50 GOTO 50
60 DATA 54,40,28,182,116,
   68,60,8
```

The potential of these modes has not yet been fully exploited. An interesting exercise is to use display lists interrupts with GRAPHICS 9 and put 256 colours on the screen at once...and that's no misprint, there are 256 distinctly different colours!

Apple, VIC, Tandy Colour Computer and Hitachi Peach owners eat your hearts out.

GARRY FRANCIS
Earlwood, NSW

Personable Computer Mag

HAVING READ every issue of this magazine I think it time for comment. I consider this would be the most 'personable' of all computer magazines.

The different styles from Les, Frank Linton-Simpkins, Leon Yendor and others provide most enjoyable reading. Bouquets also to Brendan Akhurst for his cartoons.

Would somebody please buy Les a new ribbon for his printer. His assembler articles are most valuable but, unfortunately, the listings are most unreadable.

R D GREET
Lockleys, SA

your computer clinic

What Utilities?

IN YOUR articles, you have often spoken about system utilities, but I am not sure what you are referring to.

Do you mean compilers and languages, or what? What system utilities are available for the Apple?

JG
Wollongong, NSW

System utilities are the programs that aren't actually dedicated to applications; that is, doing directly useful work such as accounting or whatever.

For example, such programs would include disk formatters and copiers, editors, text formatters, file copiers, communications programs and the like.

On the Apple for example, typical utilities would include Muffin, the program used to convert DOS 3.2 disks across to DOS 3.3, BASIC renumbering programs, FID, the general file manipulator and others such as the assembler/text editor.

Business Computer

MY PARENTS are looking to buy a computer for business purposes, but haven't had

much experience in the field.

At an exhibition, we saw a computer with which I was impressed, and I was wondering whether or not you could make any recommendations about it — it was a 'Sigma Data, IF 800'.

Unfortunately, many of the smaller systems seem too small, as the computer would have to be expandable for our purposes, and able to be used for a variety of functions to satisfy our needs. Or, do you think we would be better advised to stick with the better known and more popular systems (Apple, TRS-80, Pet, and so on)?

Adrian Goudie
Embleton, WA

From the information you have given, there is no way I could recommend a particular small business computer. The best thing you can do is read my article on Systems Analysis in Small Business (YC, November 1981), and then start defining your problem on paper.

What do you want the computer to do (general accounting, stock control, invoicing, personnel records, word processing or

what)? Work out the data storage requirements, and then see if you can find a machine with sufficient floppy or hard disk space to handle your requirements.

Ask the dealer to show you a system performing a similar (or better, identical) function to what you need. Note its speed, capability for handling the types of information you require, and so on. By then you should be on the right track.

Squeeze My Apple

I AM AT present using an Apple II computer with 48K memory, a card reader, printer, and one disk drive using DOS 3.2.

Could you please let me know where I could get some software which utilises my system completely. I only have BASIC, Applesoft, and machine language.

David Astbury
Casterton Vic

Maybe my prejudices are showing, but I always feel that the software which stretches your machine to the limits is the software you write yourself.

Why not try writing some educational programs for, say, marking tests where the answers are marked on cards? There's a big market out there for that kind of software, and it would probably have to be written in a mixture of BASIC and assembler.

Alternatively, you could try writing the first multi-user operating system for a 48K Apple — but maybe that would over-utilise the machine's capacity!

any useful references on the subject of converting a television set, both colour and black-and-white, for use as a video monitor.

G T Harrison
Manly, Qld

From memory, Electronics Today magazine ran an article on this subject back in 1976, and Electronics Australia has probably had words on the subject too.

Be Adventurous

MY FAMILY and I have a80 16K Level 2 micro and are very interested in software for it.

We are looking for an adventure game and were wondering if you could make one up (with graphics if possible) for us and other users and print it in Your Computer but please, if possible, make it in BASIC. If you could, we and other users would be very grateful.

D CROTON
Nth Dandenong, Vic

I have a better idea. Why don't you write an adventure game and send it to us.

To help you get started, Nick Gammon of Gammon and Gobbet Computer Services has given us a complete breakdown of an adventure game, written in G-Pascal, which you will find elsewhere in this issue.

From that you can see how these things are done, and writing a BASIC adventure shouldn't be too hard!

Me, I have an adventure every time I sit down to write a program such as striding forth to vanquish the evil Algol compiler, which usually burns my code to a crisp!

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LINTON-SIMPKINS

HOW REAL was Lincoln's belief in the ideals of his Gettysburg address will never now be known. But his ideal of government of the people, for the people and by the people would now seem like some form of communism to many Australians.

You see we have failed, even more tragically than many other nations, to come to terms with the conflict inherent in Government. The people who form part of the government are about control or governing other people not of the government. The outsiders wish not to be governed at all.

Which brings us to government as it is practised in our world and a suggestion that might go far along towards a true democracy. That is true democracy with each man's vote being of equal worth, but of some actual worth. This contrasts with the present position where a man's vote serves merely to endorse a selection process carried on in secret by a cabal of political party members.

Democracy is an invention of the Greeks. They were at the time a nation made up of city states, they owned slaves, practised homosexuality (practiced? They were bloody near perfect at it) and some of them practised a radical form of birth control by exposing unwanted children on mountain sides. But still democracy is a Greek word and an invention of these remarkable people.

In ancient Greece, many towns/cities/states held open-air meetings at which anyone with anything to say on a subject got to talk and votes were taken so that the whole free and male population formed a sort of parliament.

The concept is at first attractive until you realise that it would only work in small cities. But even there things got out of hand so spokesmen for the people called demagogues spoke so that time would be saved. It is these demagogues, often self-appointed, that are the direct ancestors of our politicians.

The ancient Greeks really have something to answer for there.

Paying More For Less

As time passed the people (a dirty word now and associated only with words like Republic and Democratic as in People's

Democratic Republic of Xland, and a sure sign that someone has expelled the American advisers and now has aid from places like Czechoslovakia and so on), have had less and less say in the decisions of government and have had to pay more and more for the services provided by government.

Our demagogues now take as little notice of us as the executive arm of government and we are there to once every three years or so to ratify the unruly way they have behaved on our behalf since the last election.

Now it is time to take back into the hands of the demos the right of decision making just like the ancient Greeks had. The other things they did are naturally up to the individuals. Personally I like the Exposure on the Mountain, it is a natural process and should therefore be acceptable to most religions, but would it be possible to make it retrospective in certain cases?

The solution to the re-introduction of true democracy is simple, fit each house with cable TV and a small handset. Then using the extra channels (Canadian Cable TV has a capacity of 188 channels), the people can vote on any parliamentary action.

Laws could be disallowed, ministers rusticated, prime ministers over-ruled on cabinet selections and members' pay rises slashed to below the inflation rate. The picture is one of sheer delight.

Voting Over Dinner

As I envisage it the parliament would still sit and votes would still be taken subject to the ratification in real time of the people in their lounge rooms eating their Colonel Sanders. Here is the computer industry's chance to serve humanity at a level unheard of these last 2000 years.

If my plan is adopted then one can be sure that there would be a rapid updating to Myers Report. Particularly where it refers to the effects on employment of the introduction of computers and computer related machinery. An acceptable level of unemployment is one at which the speaker still has a job.

Naturally computers have been used in politics before. The Prime Minister used

one in the famous Australian Bureau of Statistics/Facom/IBM/Harragan/IDC/Coast to Coast affair. Others have been used to count votes, plot gerrymanders, print mailing labels and even prepared research work for use at Question time.

The Dominican Republic (while not completely ignorant of it, it is hardly very experienced in democracy) is using computers to provide census data which will be used as part of a voter registration process.

The Census is long complete in the Republic, another Greek invention, Republic, by some man called Plato. The voter registration process is not a matter of great urgency. But nothing on the island is. Even the desultory wars the nation has had with its neighbour Haiti have not moved with any great speed.

But to return to my plan to revive the democratic process via cable TV and computers. We could easily check against multiple voting, the address allocated to the cable TV service at any house could also indicate how many adults had the vote.

Five And Out...

As I see it the present system of departments feeding information to ministers and a government who made decisions on which laws to enact and so on would remain until it had lost on five separate matters. Then the parliament could meet and elect a new PM and cabinet.

As you will see, I am advocating the overthrow of the political party system as well. At last count we have no less than five parties in federal parliament. Then there are the lunatic and not so lunatic, perhaps mildly disturbed, fringes and the only real political party to gain my support, the Independents.

Come to think of it, I'm advocating anarchy under computer control. Sounds familiar, doesn't it?

It might also mean the end of all those promises at election times, they are transparent to the electorate anyway. Think of it, no sound to disturb the peace but the crash of falling governments.

Perhaps we can find a way to demote a PM we don't like, to 'Usher of the Black-rod'. All we need is the proper software. □

Leon Tackles Texas

TEXANS MAY love to boast about having the biggest of everything but sometimes even that isn't enough. The number of delegates registered at this year's National Computer Conference in Houston was in excess of 93,000 and they really couldn't handle it.

Come to think of it, not many cities could — so if you plan on attending one of these you had better do it soon before they run out of places to hold it and have to impose some restrictions on the number of people attending. There is already a restriction on the number of exhibits and next year's show at Anaheim (near Disneyland) is already booked out.

One thing that sure was the biggest I've seen, although you really can't blame Texas for it, was the fouled up registration lines. Register early and avoid the long lines, said the blurb, so I sent off my cheque some time back in April and that was the last I heard until when, about a week before I left, I rang the organisers (AFIPS — the American Federation of Information Processing Societies) and found out that my name was really in the computer.

I might have been in the computer but, along with everyone else, I suffered all the long lines you could want. When I got to the desk in the S-Z queue (after laughing at the way there was no window for the G-K crowd) I found that there was no packet with my name.

Now, at NCC your packet is very important. It contains your programs and guides and I thought maybe even my entry badge, but no, that arrived last week at home by *surfemail*.

The computer was 'down' so I had to join another long line and get a badge to come back to another long line to get a packet. It didn't seem nearly so bad when I got to the counter to find that the astronaut Wally Schirra, a VIP guest doing promo-

tional appearances for DEC, was in the same boat.

What surprises me most is that there are still manufacturers around who are not only crazy enough to donate a system for this kind of flap but heroic enough to have big signs to proclaim their folly.

So what about the show itself? Well, I'd never willingly miss one because there is really nowhere else to see all the new toys in one spot. If you haven't been you should try at least one, but buy the four day ticket because you can't really cover the entire thing in less than three and make sure that you register at the International Visitors Centre so you can take the weight off your feet in comfort with a complimentary coffee or Coke.

The big manufacturers turn on some remarkable displays using professional actors to make entertainment of their sales pitches in a way that we would do well to note for some of the drab shows we turn on here. Star turns this year included:

- The Nixdorf TV show where a lady put the sales talk into a conversation with a Muppet-like character on a colour monitor. The puppet was worked by an actor concealed inside the booth who could see the audience and so ad-lib appropriately with spectators.
- The Racal Vadic stand with a magician working card tricks and boosting his sponsors at the same time in a glorious send-up of various of the sales staff.
- The Bell Telephone Teleconferencing Blackboard. A young lady would write on what appeared to be a normal blackboard with a chalk and as she wrote a reproduction appeared on a nearby monitor.

Of course it was a pressure-sensitive sheet, and even if you pressed on it with a finger you would get writing on the screen. The real hit was that she cleaned the board with a regular duster and as the

writing disappeared from the board it likewise left the monitor. Easy to work out, really, but most impressive.

As usual it is very hard to evaluate software at shows like this but you can expect to see quite a few exciting programs in the next few months if the promises are borne out. One thing I really find hard to justify, however, is the kind of nonsense like Micropro's colour WordStar for the IBM PC. Pretty, but they'd do better to make a better job of some of their recent products.

Quite a few familiar faces from Sydney were in attendance although many were moving too fast for me to catch up after I spotted them across the room. I spotted Ian Little from Ampec and Tony Madison from Ampex but both got away.

Being nailed down by working on the Morrow Designs booth, Rod Whitworth — from Automation Satham in Sydney — was easier to grab and we managed to find time to compare notes.

He was most impressed by Intel's demonstration setup with eight iAPX 432s in a box he described as looking a bit like Orak but running eight tasks first with one CPU, then two, then four and finally eight. No software changes, just better throughput every time more CPUs came on line. I don't even understand the concept of their architecture so maybe my age is catching up at last.

As I write this the show is too recent for some of the other things I saw to be more than a blur until I get through my notes and match them up with the fifteen kilos of blurb I brought back, but hopefully by next issue we can sort out some risky predictions for you and maybe run some pictures of the new releases.

They'll undoubtedly be better than the snap of me Rod managed around the end of the Morrow booth while I inspected some network equipment next door...



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your ZX81 computer

By David Brudenall

IT LOOKS as though the future for the ZX81 may not be as grim as I predicted last month; at least, not for the time being, anyway. It seems Timex, in Scotland, is going to continue manufacture of the ZX81 while Sinclair concentrates on the Spectrum.

The ZX81 is going to be known as the Timex 1000, with a joint Timex/Sinclair label. The ZX81 is not dead yet!

As promised last month, here is a selection of hardware add-ons available from the UK. Obviously I haven't included all of them but at least the majority of the products on sale as add-ons for the ZX81 are represented here.

Before I begin the list I'd like to mention two local retailers of ZX hardware add-ons: Total Control Technology and TJ Peripherals.

Total Control Technology (of PO Box 61, Happy Valley, SA, 5159), is importing 64K and 32K Memopak RAM packs, \$376 and \$299 respectively. These RAM cards are claimed to fit both the ZX81 and ZX80 (not to mention the MicroAce). It is also importing a graphics add-on, at \$352.50, and a 4K Graphics ROM at \$99.

It is also developing a proper keyboard for the ZX's, which it claims will have a few nifty tricks, like a repeat key, and so on.

TJ Peripherals is not importing hardware, but making it. It is selling its own 16K RAM pack, at the highly competitive price of \$96, which includes a gold connector, 6 months warranty and a case similar to Sinclair's own RAM pack.

It is also making an I/O port. Memory mapped, so it can be accessed through simple PEEK/POKE commands, and it only costs \$38.50. TJ Peripherals can be contacted at 41 Olympic Avenue, Cheltenham, Victoria, 3192 or 9/140-148 Crimea Road, Marsfield, NSW, 2122.

Now onto the UK list (these are listed as PRODUCT: SUPPLIERS: PRICE. Unless otherwise stated, this equipment is for the ZX81):

RAM Packs: 16K JRS Software, 19 Wayside Avenue, Worthing, Sussex BN13 3JU £35. 48K Memotech (Sales Dept.), 103 Walton Street, Oxford, OX2 6EB. £109 (kit) £129 (assem.). 16K CEL Customised Electronics Ltd., Winkler Green Mills, Stanningley Road, Armley, Leeds, LS12 3BB. £34.50. 16K Kayde Electronic Systems Ltd., The Conge, Great Yarmouth, Norfolk, NR30 1PJ. £29.95.

ZX81 Console: ZX Business Systems, 14

Brookfield Gardens, Ryde, Isle of Wight. £15. (This console has space for all your ZX peripherals and is claimed to prevent RAM pack glitch). A case for carrying all your ZX equipment around in is also selling for £25.

Joysticks: Microgen, 24 Agar Crescent, Bracknell, Berks. Controller board for joysticks £19.50; Joysticks £9.60 each.

Disk Drive: The Monolith Electronics Co. Ltd., 5/[Church Street, Crewkerne, Somerset TA18 7HR. £200. Specs: 70K storage/disk, 3K per second loading time, 2K ROM added for operating the drive, Printer and RAM pack connect to the drive, operable through BASIC via USR calls.



I/O Ports: Thurnall (Electronic) Eng., 95 Liverpool Road, Cadishead, Manchester, M30 5BG. £10.99 (kit); £12.99 (assem.). Haven Hardware, 4 Asby Road, Asby, Workington, Cumbria, CA14 4RR. (Price unknown). William Stuart Systems Ltd., Dower House, Billerich Road, Herongate, Brentwood, Essex CM13 3SD (16 line control port which can be used as a music synthesiser if connected to a keyboard) £19.50 (kit); £25 (assem.). University Computers, 5 St Barnabas Road, Cambridge, CB1 2BU £16.50.

Print Jotter: Butler, Currie & Hook, 19 Borough High Street, London, SE1 9SE. These are jotters films for laying out PRINT/PLOT positions etc. Jotters £3.50; transparent films — £16.50 Char. Gen: Haven Hardware, 4 Asby Road,

Asby, Workington, Cumbria, CA14 4RR (this is a programmable character generator) price unknown. Quicksilver, 95 Upper Brownhill Road, Maybush, Soton. Hants. £26 (128 separately programmable characters possible).

Keyboards: Kayde Electronics Systems Ltd., The Conge, Great Yarmouth, Norfolk NR30 1PJ. £37.95 fully cased; £27.95 uncased. Haven Hardware, 4 Asby Road, Asby, Workington, Cumbria, CA14 4RR. Price unknown. Fuller Micro Systems, The ZX Centre, Sweeting Street, Liverpool 2. £24.95 (keyboard only — built); £18.95 (keyboard only, kit); £39.95 pounds (complete case for ZX81 with keyboard).

Hi-Res Board: £2 from the above address.

Speech Recog.: William Stuart Systems Ltd., Dower House, Billerich Road, Herongate, Brentwood, Essex, CM13 3SD. This is the 'big ears' speech recognition unit. £49.

Slow for ZX80: Compshop, 14 Station Road, New Barnet, Hertfordshire, EN5 1QW. £12.95 (kit). This allows the 8K ROM ZX80 to work in SLOW mode.

Colourboard: Haven Hardware, 4 Asby Road, Asby, Workington, Cumbria, CA14 4RR. (Price unknown).

Well, that's a fairly comprehensive list, although all suppliers are not listed. For instance, many companies seem to stock ZX add-on keyboards, but I haven't included them all as some have already been mentioned in publications such as *Your Computer* (like Radditch Electronics), and anyway, it would have been practically impossible to list every supplier that sold a ZX keyboard!!

If anybody out there is into hardware mods/do-it-yourself type activities and wants an 8-line I/O port for their ZX81, AZUA member Ken Hince has designed his own I/O port, and has put it to good use by interfacing it to a Dick Smith GB80 printer.

AZUA is presenting the full details on the hardware and software of this I/O port (which can be memory or I/O mapped) as a four-part article in the newsletter. To get the details of this port and how to use it in conjunction with a Dick Smith GP80 printer, there is one small catch — you have to join AZUA!

Membership in AZUA is \$10/year or \$6 for six months. Write to the address in the clubs page. Don't forget you can always send a 40c stamp and get a free intro newsletter!

your ZX80 computer

John Batty

I HOPE not too many people were disappointed by the absence of this column over the last couple of months — the break was forced on me by pressure of work in other spheres. However, I hope now to be back on a regular basis with some programs and ideas for those amongst us with only 4K ROM and 1K RAM to their name.

To Mr Don De Ieso, of St Peters, SA, whose letter appeared in Text File in the May issue, and to others who may be interested in peripherals and software development by Sinclair: I am making every effort to get information from Sinclair (England), not only on equipment and software on the Australian market, but also on those items which are not yet available here in the hope that one day they might be.

If anyone out there knows a friendly importer, maybe they can put in a good word when and if I can bring you a list of available goodies. I hope I can get more details of the new Sinclair Spectrum, too.

I have been trying for some time now to overcome some of the inherent restrictions the ZX80 has with regard to creating mazes. For instance, it is difficult to create a static (non-changing) maze of any complexity because of the need to clear the screen so often, and the difficulty of mixing graphics with text.

It can be done, of course, but the programs are usually pretty bulky and unnecessarily complex. While reading through a foreign magazine recently I saw an article which put forward the technique of converting maze parameters into mathematical formulae, allowing a random maze of fairly complicated layout to be formed.

Unfortunately, the sample runs of this idea used formulae based on trigonometric expressions, so they couldn't be used for our little ZX80s with our integer maths.

However, with a little thought it is possible to make use of the broad idea. Why not, I thought, have the obstacles formed only in RAM, not on screen, giving a new dimension to the maze — you don't know a wall is there until you've walked into it (I've been that way a few times myself without the aid of a computer).

It is possible to map this maze on a sheet of paper, as the co-ordinates are chosen randomly at the beginning of the program and remain unchanged throughout. These co-ordinates are based on a compass rose, that is, N, S, E, W, and are read out at the top of the screen.

Your starting point is also random, but always in the NW quadrant, and the survivors, whom you must find, are also in a random position, always in the SE quadrant. The grid, delineated in 20 to 90, is 200 units West to East by 200 units North to South, giving 40,000 separate locations, only one of which holds your target!

This could easily be changed of course. The maze itself is fairly simple in this form, consisting of only one block in each quadrant, and may look like Figure 1 on a map. Point 1 is your start point, and point 2 is your target. This may not look too complicated, but you try to find point 2 when you have to feel your way there, blind.

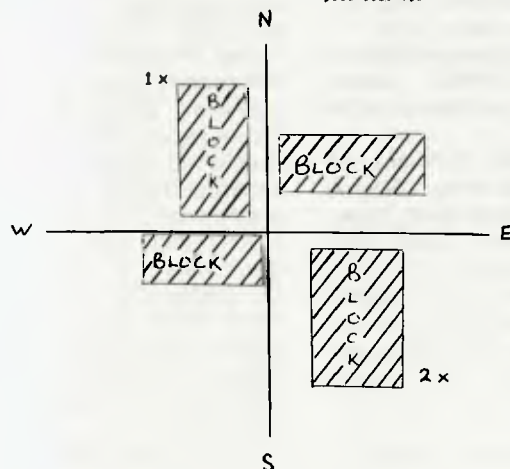
With some juggling of figures in the first few lines and a few changes in the main program the obstacles could probably be made a lot more daunting — this program is only to illustrate the idea. The same technique could be used for laying minefields, in combat games, or navigation points, or any program which has a need for you to pinpoint an imaginary position.

I would be interested to see any variations you may come up with — maybe a program based on 'Battleships' could use this system? By the way, to steer your way through this program, use the cursor arrows and, if you get sick of searching, input 0 — the relative positions of you and your target will read out, and the game will stop.

Lot's of luck (you'll need it). See you next month. □

```

10 ZX80
11 CH F .TY
12 J.BATTY 1987.
20 LET N=RND(50)
30 LET N1=RND(50)+50
40 LET S=RND(50)
50 LET S1=RND(50)+50
60 LET W=RND(50)
    
```



```

70 LET W1=RND(50)+50
80 LET E=RND(50)
90 LET E1=RND(50)+50
91 LET T1=S1+RND(10)-5
92 LET T2=S1+RND(10)-5
100 LET U=RND(50)
110 LET D=RND(50)
120 LET L=RND(50)
130 LET R=RND(50)
140 GOSUB 2000
170 CIS
180 PRINT "POSITION: ";U;"N ";D;"S ";L;"E ";R;"W"
190 PRINT "WHICH WAY (4 ROWS) OR 0 TO QUIT"
200 INPUT V
205 IF V=0 THEN PRINT "TARGET: T2;"E ";T1;"S"
206 IF V=0 THEN GOTO 170
210 IF V=5 THEN LET L=L+1
220 IF V=6 THEN LET D=D+1
230 IF V=7 THEN LET U=U+1
240 IF V=8 THEN LET R=R+1
245 GOSUB 2000
250 IF V=5 THEN LET R=R-1
260 IF V=6 THEN LET U=U-1
270 IF V=7 THEN LET D=D-1
280 IF V=8 THEN LET L=L-1
290 GOSUB 2000
300 GOSUB 2050
310 IF 100 R=T2 OR S=T1 THEN GOTO 170
320 PRINT "SURVIVOR FOUND"
330 STOP
2000 IF U>1 THEN LET D=D
2010 IF D>1 THEN LET U=U
2020 IF L>1 THEN LET R=R
2030 IF R>1 THEN LET L=L
2040 RETURN
2050 IF U>N AND U<N1 AND L>W AND L<W1 THEN GOTO 3000
2060 IF U>N AND U<N1 AND R>E AND R<E1 THEN GOTO 3000
2070 IF D>S AND D<S1 AND R>E AND R<E1 THEN GOTO 3000
2080 IF D>S AND D<S1 AND L>W AND L<W1 THEN GOTO 3000
2090 RETURN
3000 PRINT "BLOCK-BACK OFF"
3010 INPUT B
3020 IF B=5 THEN LET L=L-1
3030 IF B=6 THEN LET D=D-1
3040 IF B=7 THEN LET U=U-1
3050 IF B=8 THEN LET R=R-1
3060 GOTO 190
    
```


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your TRS80 computer

By Rod Stevenson

WHAT YOU buy is what you get. This statement would seem totally unnecessary were it not for the (unfortunately relatively large) number of newcomers to the computing hobby who decide to buy a computer, then find they haven't got what they thought they would have.

That's not to say that there is even the slightest dishonesty practised by those who sell, merely that the aforementioned have not gone to the trouble of talking to seasoned computer hobbyists before spending their money on what they think they want.

The reason I bring this up here is that I hope that this magazine is read by intending computer-hobbyists before buying. And certainly I mean it to apply not only to TRS-80 buyers — I've encountered the same unhappiness from owners of most computers. And not only 'personal' ones either.

My obvious suggestion is to go to a club meeting and talk about your ideas. Admit that you want/need advice and help. Far better to do that than to go along after you've bought to find out how to get it to do what you thought it would.

Certainly there's some truth in the thought that club members will be biased, and will try to convince you to follow in their footsteps: so attend a variety of meetings and get a wide cross-section of options about as many of the contenders in your bracket as you can.

It is truly amazing just how many will tell the world at large how wonderful their particular choice of equipment is, while at club meetings be among the loudest to berate its shortcomings.

And a word to those who might think of justifying their hobby-type interest by persuading their business to make the purchase. Be realistic! Admit (to yourself) that your interest is a hobby one.

It really will be much more satisfying (not to say ethical) to be able to choose a unit that more closely suits your desire. For the difference is not merely one of price — an office-worker doesn't have the same needs as a hobbyist.

However, while on this subject, I'm constantly amazed by the number of hobbyists I know who are loath to admit their equipment is a hobby. I'm at a complete loss to understand why, but it does seem to be considered 'the thing' to claim (to friends, not the tax-man) that one's computer is used for business.

Backup Copies

The following applies equally to tape

and disk, although it does seem there's more scope for losing data from the disk. But whatever the reason, when it's gone it's gone! And too late to wish then you'd developed the habit of regularly backing-up, and updating those backups so the loss is as small as realistically possible.

At the very minimum this means two copies; the one in use becoming the backup as soon as it's had some fresh data recorded. And PLEASE don't use the one disk (or tape) for the two copies!

The dangers are self-evident — among other things, a material failure will mean you've lost the lot. How familiar is it to hear 'but I thought it wouldn't happen to me...'? Just wait until you lose the only manuscript of a 160 page book you haven't backed up because 'the disk wasn't aash'.

And it's not being extreme to keep these copies in different places — even different buildings on opposite sides of the street — if the data is truly irreplaceable. Irreplaceable it may well be in the financial/business area.

Yet I'm still constantly amazed by the lack of backup-procedure/policy for such sensitive information. Even if not as vital as this, isn't your own blood-sweating work worth safeguarding? And particularly when it takes such little effort, even if that effort is somewhat boring.

I must admit to being among the guilty. While I don't back-up everything, I do keep two copies of what I consider valuable in the normal place, plus a backup copy in my bedside drawers. No, Les, not for some fantastically kinky reason, just for a separate safe place from my other programs...

Repetitive Reading

Perhaps the best advice I can give in learning anything is to read and listen to as many different explanations as available on the same subject.

It's easy enough to miss the one vital sentence you need for a perfect understanding. Many times I've had it 'click' only after following this course.

And if you've ever tried to explain a difficult concept you'll know just how hard it is to see where the difficulty lies in 'getting through'.

The next best is Do-It-Yourself. Nothing could be truer than the often quoted notion that experimentation is the only real path to true understanding and knowledge. And don't just nod your head in concurrence — heed me!

So many of the members of our (the Adelaide Users' Group) beginners' groups have come back to me after

they've been 'let loose' and assured me it's true, that I'd be remiss in not passing on their assurance. Yes I know it's easier to ask, and probably you'll get out of 'the hole' quickly and painlessly; only to fall right back into the same one next time.

Which is not to say, however, that you should be afraid of seeking assistance where appropriate, and after having tried yourself.

Apart from the obvious case where the actual knowledge is lacking and needs a simple injection of facts, it's maddeningly easy to keep on looking at and not seeing the same mistake. And some are so simple that we're convinced we 'couldn't possibly be so stupid' that we don't even bother checking.

I readily confess that many is the time another has immediately spied my crassness! True, sometimes a fresh mind will do wonders; it's good though to have someone to use as a backstop, and to allow yourself to be so used. Yet another benefit of the club environment.

Memory Size

This seems a baffling idea for the newcomer to grasp, and I suspect it better belongs in its own separate article. But here goes anyway:

Normally BASIC programs always start at the same point (42E9H for level 2), and load there from tape or disk. Which is just as well, because among the whole heap of pointers kept by the operating system is one that tells it where to find the start of a BASIC program when it sees (RUN) on the screen.

So all it has to do is to go to that address and all is well. Which (I hope!) will make it obvious that the 'normal' thing is to have only one BASIC program resident at a time. Of course there are ways of 'fiddling', but let's not get carried away in this short space.

Now with a machine-code (system) program we're not so confined. Because we're assumed to be aware enough to want to, and be able to, (not always the same) write assembly/machine-code, it's assumed we will want to choose where to put our program. And it's true; we do want to choose an appropriate place for it. So we're given the facility not only to instruct our machine where to put it (?), but also where to start running it from. Which is why there's an entry- (sometimes called a transfer-) address usually noted in the documentation.

This is usually supplied to the operating

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your CP/M computer

By Bill Bolton

THIS month I'd intended to discuss the various CP/M assemblers but I had a phone conversation with a distraught RCPM user who was having terrible reliability problems with his system. As this seems to be a perennial problem I think that it's about time that we go through, in detail, some of the factors which govern the overall reliability of any computer system. The assemblers will have to wait for a future column.

The following is based on material by Kelly Smith that appeared in the now defunct CP/M-NET newsletter. Thanks Kelly.

Feeding Your Micro

Carefully consider the power input source for your microcomputer system.

Ideally the computer power circuit should be on it's own breaker isolated from the rest of the general purpose outlets that service the various appliances in your home. It may be a little tedious to determine this, but well worth the trouble.

Just take a small lamp (as a voltage indicator), turn off all but one of the power (as distinct from lighting) circuit breakers (or alternatively remove the fuses if you don't have circuit breakers) to your home, they may even already be marked as to which breaker services which room. Now plug in the lamp to the outlet you want to use for your computer. If it does not light, turn the circuit breaker off and try another until you locate the one that services the outlet you want to use...easy!

The important point here is to insure the power has a direct and isolated path to your system. Now that we have isolated the path, plug the lamp into the remaining power outlets, making note of what else is on the power line. It's very important, and here's why: We need to remove (or minimise) the number of 'power hungry' and 'glitch producing' appliances attached to your system's power line!

The 'power hungry' appliances you may have are portable electric heaters, electric ovens and stoves, toasters, and so on that singly or in combination can drop the (otherwise) available input line voltage to as little as 210 V AC or less.

Low line voltage in combination with (typically) non-regulated microcomputer power supplies will give your system a localised 'brown-out' effect that may not be readily apparent to you because other devices around your home (for example, radio, television, fluorescent lighting) may be happy working in this situation.



Most S-100 buss type systems are especially prone to the localised brown-out effect, because the non-regulated (read cheap to manufacture) power supply that provides +8 V DC, and +-16 V DC, to the system's mother-board buss, is regulated separately on each card in the microcomputer. These individual boards then (hopefully) regulate the +5 V DC, and +-12 V DC required by the various integrated circuits and components on these boards.

These regulators require (at a minimum) 3 volts of 'head room' for proper operation — that is, the on-board ICs use +5 V DC and therefore require a raw input to the regulators of +8 V DC.

This can easily be measured with a low cost voltmeter purchased from your local electronics or hardware store...nothing fancy required; any meter in the \$10 to \$20 category will be fine.

Refer to the microcomputer manufacturer's details on the layout of each board's regulator input/output (and ground) pin assignments and follow the 'three volt rule' to determine if your computer is being fed the proper diet of raw input voltage (measure *directly* at the *input* and *ground* terminals).

Beware: the DC voltage value may appear to be correct, but due to poor power supply filtering in your raw supply, may have an AC composite voltage (called ripple) that 'droops' below the head-room required by the individual on-board voltage regulators.

Again using your cheap voltmeter,

switch to the lowest AC voltage range possible, and measure the input voltage again. Any measurable voltage means potential (no pun intended) trouble, with the effect of 'mini-brown-outs' every half-cycle of the AC line voltage (10 milliseconds for a 50 hertz input).

Keeping in mind that your microcomputer will be executing commands (instructions) millions of time per second, 10 milliseconds is a considerable amount of execution time to your system...and (bluntly) the system *must not fail to correctly execute any command — ever!*

Murphy's Law of Zapped Program Execution states that 'one bad instruction will modify other instructions (the Avalanche Effect) and will *always* occur after four hours of editing a program, with *no* back-up file!'

What can you do if you find trouble with the input power voltage? One of three things: find an AC input line voltage source that is **solid** (that is, one which really is 240 V AC!); purchase a pre-regulated (expensive) power source; or *give up now!*

If you don't do one of these things there is no hope ahead for trouble-free operation of your system...just frustration, tears, alcoholism or whatever. This is the first level for the computer hackers' phrase 'Garbage in equals garbage out' — solve this problem *now!*

So, we've discussed the potential 'power hogging' problems (and their detection and avoidance), but what about the 'glitch producing' appliances that are lurking to raise havoc with the computer?

Here arises the potential for not only spurious problems that clobber your system (and possibly hours of work), but expensive damage to your system. Another rule to remember: if it has a motor in it, avoid it!

This includes refrigerators, air conditioners, washers and dryers, electric typewriters...anything with motors or solenoids. These appliances provide a double edged problem: When turned on, they can provide our computer with the 'brown-out' effect, and in addition, put transient voltages (some times on the order of hundreds of volts) into an otherwise 'clean' AC power line.

Although these transient voltages are of short duration, they can (and do) find their way directly through your microcomputer's power supply, and will cause a host of problems. Many of the components in your computer are extremely sensitive to

sudden high voltage conditions, and can cause your system to perform in strange and wonderful ways months after the high voltage 'zap' condition has passed!

Kelly had an IMSAI that suffered many 'sudden deaths' with bad ICs appearing daily for almost *three months*. She came very close to scrapping it!

So track down these 'glitch producers' and get them off of your system's power. Even small (and usually unsuspecting) appliances can cause you to weep aloud...automatic heat regulating soldering irons (like the one next to your system right now) will 'pop' the AC power line with voltage spikes that, although they may not cause damage, will cause erratic operation of your computer. This tends to manifest itself in the form of 'bad diskettes' or 'bad memory'...not so! Turn that soldering iron off when you are using your system...even if debugging, or you will chase-your-tail trying to figure out what's going on!

Transient voltage suppression devices or filters are available that may be directly wired into the AC input of your microcomputer's power supply, or can be purchased built-in to a power outlet box. Be warned, however, that they are limited in trapping various combinations of transient voltage, duration, and frequency (and expensive to boot).

You are better off getting rid of trouble at the source, rather than attempting to rid your microcomputer of glitches after the fact.

Keeping Your (Micro) Cool

Possibly the worst offender here is the cooling system (or lack of it). How and why, you ask?

Well, first of all are those foam filters that cover the fan inlet (if you even are lucky enough to have a fan...) that is trying to provide not only cool air, but also clean air.

That dust and dirt has to go somewhere, so where else but the filter — and depending on how tidy we are, will build up with crud very fast.

Here's what I do — throw 'em away! Yes, the dirt and dust get in, but for the most part it also blows out again. Much better to let the internals get a little dusty than to forget to remove and clean the filter once a month. Air filters mounted in the back of a computer are bad psychologically anyway: 'After all, it's in the back of the system, and whose going to see the slob that we are anyway!' — right?

Alright, now we are getting cool air into the microcomputer (and it will *keep* getting in), but is it actually getting to where it's needed?

Light-up something that will produce a bit of smoke (hopefully not a cigarette) and, now with the cover off of your computer, place that smoke producer six to eight inches downstream from the incoming air flow — where does the smoke go? Ahah! Mostly out the vent holes right next to the fan...

Block that with some masking tape (or whatever) and cardboard. Try again...hmmm, much better. Now is the flow of air actually blowing through the boards in your system? If your answer is 'a little', use more masking tape and cardboard and channel the airflow directly into the boards. It might look like hell, but once you get the cover back on, who cares?

You may have to get really clever building a good airflow system into your microcomputer. Cooling always seems to be an afterthought in most of the boxes I've seen — the IMSAI 8080 chassis has the power transformer parked directly in front of the fan, blocking the airflow...poor planning, but with a little work (masking tape and cardboard) it runs pretty cool, even with fifteen cards in the system!

Some microcomputer chassis rely on convection cooling alone to keep them cool (Apple, Osborne, and the like). If the temperature is warm on the outside, count on a 10 to 20 degree rise on the inside. The point here is: keep the room that your microcomputer is in cool; about 25 degrees is comfortable for the internals.

Avoid placing your system in a place where it gets direct sunlight, or if it's in a cabinet with additional peripheral parts of your system (especially disk drives), mount it underneath all that stuff — remember, hot air rises.

Radiated Disaster

We have discussed radiated heat doing nasty things, but have you considered all the potential sources (and types) of radiated energy that cause no end to giving us grief?

Consider that telephone you use with your modem to communicate with other systems...makes a good place to lean a stack of floppy disks against, right?

Wrong! That bell you hear ringing is magnetically driven!

And now is as good time as any to read the back of the jacket that you keep your diskettes in (what? you *don't* keep them in

their jackets? *Argh!*). Even if you can't read, there are some pretty good clues with pictures: look at the one showing a horse-shoe magnet — it's the same one inside your telephone!

Why they put the dos and don'ts on the back of the diskette jacket I will never know, but now I have reminded you it's there, read it and take it to heart. Good words of wisdom back there... Of course, the microcomputer itself is a good source of magnetic energy, especially if it's enclosed in a plastic case. Where? The transformer in the power supply. Make every attempt to keep your diskettes away from this area of your system.

Some computer terminals also radiate magnetic energy that is strong enough to erase diskettes. It's a good practice not to lay diskettes on top of your terminal — too near the fly-back transformer and CRT yoke (magnetic coils) for comfort.

Other (more bizarre) sources include the X-Ray machine at the airport. The X-Rays themselves will not clobber a diskette, but the the magnetic field which focus the X-Rays sure as hell will.

And, on the other hand, while EP-ROM's don't mind magnetic fields the X-Rays are excellent for a quick erase job! Hand carry these items (if you want them intact) and don't allow them to be X-Rayed. I even mark boxes of diskettes for mailing with 'Do not X-Ray. Magnetic Media Inside' — better safe than sorry.

And speaking of airports, do you live near an airport, or industrial area using radar? Similar problem here as the X-Ray machine only it's high energy pulses of power that travel many miles that can clobber your system. You know when this is happening, because you can set your watch by the time (sweep of the dish antenna) it 'blips' your system. This is a rare situation for most home environments, but none the less, does happen; just be aware of the possibilities.

Then there is static discharge. If you can, place your microcomputer system in a room without rugs, especially nylon rugs. If that's not possible, get an anti-static mat placed in front of your system (where you sit), and also get a can of anti-static spray (the stuff your wife uses so that her cloths don't cling) and liberally apply it to the rug around your system.

Also, office chairs on rolling rubber wheels make dandy generators of static electricity; they're fine on an anti-static mat, but disaster on a rug for your system.

Also, when working on some of the



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boards in your system (even if its just to change addressing on a memory board), make sure that you do not give these boards a dishonorable discharge — ground yourself out prior to yanking any boards from the system. Even discharging directly to the chassis of the system is better than through one of the computer's boards; at least the discharge path is most likely to go back to the protective ground at the wall socket, not to some expensive ICs!

Phew...Paranoid Yet?

Well, if that wasn't enough to make you paranoid about where you put your system and what to feed it I don't know what will. Attention to these sorts of details can turn an unreliable system into an extremely reliable one. I had to do the power supply checking and air flow testing to get the RCPM system reliable, for example.

I have lots of Jabel F500 mains filters around my system and they seem to keep the 'glitches' out fairly well. I have a Kambrook mains intercom sitting across the power circuit used exclusively by my computers — as well as serving its intended domestic communications purpose it has turned out to be a very good glitch monitor. Any noise or glitches on the power circuit are audibly evident on the intercom and I simply go around with one of the Jabel filters till I've isolated the source of the noise. One of the worst noise sources turned out to be my Diablo printer...

RCPM News

The number of calls is now over 800. Users of the system had the first news about the Dick Smith direct connect modem, well over a week before anything appeared in print.

Four new volumes of BDS 'C' users group software have recently been added to the software base. There are also 11 volumes of public domain CP/M programs from Australian and US sources, which are not available elsewhere, available through the system.

A large number of users now have the communications utilities running and are downloading software. A few have started to contribute material as well.

To get the 6 page set of 'Connection Notes' send a large (A4) SSAE to:
CP/M Bulletin Board,
P.O. Box 80,
Newport Beach,
NSW, 2106.

your PEACH computer

By Dom Swinkels

THE PEACH computer has many features not found in most earlier machines. At initial power up it starts to operate in a mode determined by the settings of three hardware components. These are the DIP switch and the CS1 jumper switch inside the case and the MODE switch on the front control panel above the keyboard.

The DIP switch consists of a row of eight small switches, which can be open (1) or closed (0). There are, therefore, 256 possible ways of setting these switches — so there are 256 different ways of operating your Peach computer. The effect of the various settings of the DIP switch are summarised in Figure 1.

The effect of switches one to three may be modified by CS1 and the MODE switch, so that we can choose one or two modes of operation at power up without opening the case.

To do this we choose which of the first three DIP switch functions we would like to control with the MODE switch. We then place that switch in the open (1) position and place the jumper on CS1 in the position indicated in the CS1 column.

For example, if we want the MODE switch to act as a 40/80 character/line switch switch 3 must be open (1) and the jumper in CS1 must be placed over pins 1 and 2.

Soft Power Up

Once your machine has been powered up (and Disk BASIC has been auto-loaded if you are using disks) you can still change to any of the 256 operating modes by the NEW ON n command where n has a value in the range 0-255.

This command causes a soft power up during which any programs in memory are lost and a new mode of operation is established, based on the value of n. The value of n required for a given mode is equal to the decimal equivalent of the binary number represented by the settings of the DIP switch.

In other words to find n you add together the decimal equivalents listed in the left column in Figure 1 for each of the DIP switches for which you select the 1 option. For example, if I want to change to BASIC (1) with interlace on (2), 80 character/line (4), high resolution (0) and displaying the PF-keys (16) then $n = 1 + 2 + 4 + 0 + 16$, or 23, and the command is NEW ON 23.

Seven of the eight mode selections can also be changed by individual software commands as summarised in the right hand column of Figure 1.

Peachy Terminal

One of these is the TERM command, which changes the operation of the Peach from a stand-alone computer to a terminal to another computer via the RS-232C connector at the back of the machine.

The ASCII string following the TERM command controls five different modes of operating as a terminal, two of which can also be set by the DIP switch and the NEW ON n command.

However, we will not consider the use of the Peach as a terminal further at this time.

DIP switch 5 determines whether the contents of the programmable function keys are displayed on the bottom of the screen or not. Each PF-key can contain up to 15 characters, all of which can be displayed in the 40 character/line mode.

The software command which also controls the PF-key display is the console command, which has the format CONSOLE n1, n2, n3 or CONS. n1, n2, n3. The parameter which selects the PF-key display is n3: 0 for no display, 1 for display; n1 and n2 are the starting line and number of lines of the scrolling window respectively. Thus CONSOLE 0, 24, 1 sets the scrolling window to 24 lines starting at the top (line 0) and displays the contents of the PF-key buffers.

The display can have either 40

characters per line (large and easy to read) or 80 characters per line (more information on the screen).

If we have powered up with 80 characters/line we can subsequently change to 40 using the WIDTH 40 or W.40 command and back again using WIDTH 80 or W.80.

If, however, we power up with 40 characters/line we cannot go to 80 this way. The reason is that at power up an amount of memory is set aside for the screen display according to the conditions of power up. This amount of memory is the largest amount which can be used for the screen display.

We can use less of it (go from 80 to 40) but we cannot enlarge it without going through the power-up routine (and wiping any program in memory). My recommendation is therefore to power up for 80 characters/line and change to 40 using the W.40 command when needed.

Screen Power

One of the most powerful software commands on the Peach is probably the SCREEN command. It has the form SCREEN n1, n2, n3. Here n3 can be 0 or 1 which determines whether interlace is on (0) or off (1). 'Interlace on' gives a better

Continued on page 95

Figure 1. SUMMARY OF PEACH MODE OF OPERATION SWITCHES AND COMMANDS.

DECIMAL EQUIV.	SWITCH	LSB	DIP SWITCH	CS1	MODE SWITCH	SOFTWARE COMMAND
1	1	1	1=BASIC 0=Terminal mode	4-5	down=1=BASIC up=0=Terminal	Ctrl-D in terminal mode TERM "5 characters"
2	2	1	1=Interlace on 0=No interlace	2-3 or 3-4	down=1=Interlace on up=0=No interlace	SCREEN n1,n2,0 SCREEN n1,n2,1
4	3	1	1=80 characters/line 0=40 characters/line	1-2	down=1=80 char/line up=0=40 char/line	WIDTH 80 or W.80 WIDTH 40 or W.40
8	4	1	1=Normal resolution screen 0=High resolution screen			SCREEN 0 or SCREEN 0,n2,n3 SCREEN 1 or SCREEN 1,n2,n3
16	5	1	1=Display PF-keys 0=No display of PF-keys			CONSOLE n1,n2,1 CONSOLE n1,n2,0
32	6	1	1=Half duplex terminal 0=Full duplex terminal			TERM "xxxxH" TERM "xxxxF"
64	7	1	1=7 bits/character 0=8 bits/character			TERM "x7xxx" TERM "x8xxx"
128	8	1	1=Convert Hiragana code to Katakana code on printing 0=No conversion			

MSB

OPEN CLOSED

To find the setting of the DIP switch PRINT PEEK (&HFFC9) or (&54B1) and convert decimal to binary.

To change any of the modes by a soft power up, use NEW ON n where n=0-255 equivalent to the binary value of the DIP switch.

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PO Box 21, Waterloo, NSW 2017.

For Sale: OSI C1P Series II. Including all available manual + cassette unit + cables. \$500. Phone Paul after 7pm — (02) 607 6228.

System 80: 16K, green screen monitor, programs and books. \$750. Ph: (02) 713 7116.

Apple II Europlus: 48K Family System drive plus \$1000 software. 4 months old. All offers considered. Ph: (02) 328 7334.

Super 80: 32K RAM, EPROM BASIC, S100, in case, detached keyboard in case, manuals, etc. \$270. (090 339 5964. a/h.

Sell ZX81: includes 1 16K RAM Pack, 1 Tape recorder all leads and manuals included, 5 tape programs. Sell for \$320. Ph: (03) 578 9627.

Super 80: 48K BASIC in ROM, in case with S100, I.C. sockets, manuals, software Editor/Assembler. \$550 o.n.o. Ph: (046) 66 8956.

ZX81 Winged Adventure: New from U.K. Fast moving, machine code game, (like PHEONIX). 'Eggs', 'Birds', each moving independently, rapid fire laser, dumb and smart missiles. deflector shield, control centre, 7 levels of play. Needs 16K RAM. Only \$18.00 from K. J. Software, 8 Cawrse Street, Elizabeth Field, S.A., 5113.

Wanted ZX81: cheap. Write, 2 Lewis Street, Samson, W.A., 6163 or phone (09) 337 3400 reverse charges after 8.00pm.

TRS-80 Owners: add 16K of extra memory inside the keyboard for \$20. Send \$6.00 for complete instructions. G. Wain, 3 Malakoff Street, Nth Caulfield, 3161.

VIC-20: American model plus C2N cassette, \$350 or VIC-20 only \$280. Ron Wilson (02) 634 1162.

ZX81 Programs: 15 listed programs. Send \$10 postal order to Poseidon Software, 72 May Street, Preston, Melb., 3172.

Apple Software: 1. The Voice; For the Apple computer by Muse. Runs on DOS 3.2 as new \$20.00. 2. Super-Text II; Word processor for the Apple. Runs on DOS 3.2 as new \$40.00. 3. Expediter; Applesoft Compiler. Very useful and uncomplicated. Phone: Melbourne (03) 723 3631 after 3pm.

Super-80: game cassettes — Jumble-word and Guess The Word (similar to Hangman). \$10.00 each. Send cheque/money order to: Alpha Electronics, 25 Shiel Street, Toowoomba, Qld 4350.

Sorcerer: 32K + Hi-Res Monitor (not TV), DEVpac, lots software. \$1000. Godbout 32K S100 static RAM card. \$250. Terry (02) 682 4649 a/h.

ETI 660 Colour Computer: Chip-8 monitor with 3K RAM, some programs, suit learner or experimenter. \$120 o.n.o. Ph: (03) 762 3058.

To Sell or Swap: TRS programs. Penetrator, Galaxians, Meteor Mission, Cosmic Invasion, Killer Beetles and more. Phone Blake on (02) 387 3528.

A1 New Sorcerer: 32K MKII warranty \$1095. Sorcerer, dual stringy floppies, DEVpac wordprocessor, extra monitor, 80 programs \$1600. Ph: (02) 449 3647.

Thunderclock Plus: calendar/clock card for Apple, \$160 including Pascal software.

Apple Parallel Interface, \$180. Both perfect condition. Stephen Page (07) 370 2023.

VIC-20: Six programs on tape for \$18. All will run in standard machine. Send cheque or M/O to C. Allen, 58 Bell Street, Chinchilla, Qld. 4413.

Sell: Sorcerer development ROMpac with manuals and Osbourne's Z

To Suit ZX-80: 16K RAM, 4K ROM and 8K ROM with manuals and notes. Must sell. \$150 o.n.o. Ph: (03) 762 3058.

Apple II software: all types, good prices. Ph (02) 328 7334.

Wanted: copy of 'Pet Revealed' \$20.00 paid. Dr E. H. Plunkett, 7 Hill Street, Eugowra, 2806. Ph: (068) 59 2472.

FOR SALE

Owing to major upgrade in system, I have several S-100 boards for sale: 2 x 8K RAM boards — \$80 ea., Morrow S-100 8080 CPU with octal front panel — \$150, DG640 VDU — \$80, Morrow Speakeasy cassette i/f with serial and parallel ports, assembler/text editor and BASIC — \$100, SSM VB3 80 x 24 or 51 video board with 8K RAM and AED driver s/w — \$500, stereo sound effects board — \$80, keyboard — \$70. 3Q 12-inch green phosphor CRT \$175. All in excellent condition (had good home), almost a complete system — I'll assist any buyer who wants it as a system. Les Bell, 439 6875 (wk).

NB Above would make a great bulletin board or network node!

Reflections On The MicroBee

By Eric Lindsay

WHEN A new microcomputer reaches the market one of the first things to happen is that hundreds of people start writing new versions of Nim and Hangman and Mastermind. I would like to persuade some of those about to start working with the MicroBee to be just a bit more ambitious.

Look at the characteristics of the MicroBee. Ask yourself what are its strengths and weaknesses, ask what sort of material Applied Technology is likely to provide, and work from there. There is really not all that much point in converting a variety of TRS 80 programs to run on the Bee; others will do that, since having equivalent graphic commands make it an obvious thing to do.

The real strength of the Bee lines in its cheapness, the compact design, the excellent peripheral control equipment, and the potentially great graphics. The major weakness is the good, but non-standard and somewhat slow, BASIC. This is not to say that the BASIC is poor. It contains much not found in more ordinary micros, however compatibility is not its strong point. So speculate outrageously, and then start designing.

Obviously, Applied Technology will fill the major hardware and software needs first. Its editor assembler EPROM also functions as a reasonable text editor/word processor, so if you are thinking of writing a word processor, make sure it is excellent, and not just a patch job to write a letter.

Likewise, Applied Technology plans to provide a disk drive, so it is probably a waste of time to design your own disk controller card. However there may be a place for a means of interfacing a cheaper drive than the elaborate Micropolis drive Applied Technology appears to favour.

Since the BASIC contains a NET keyword, turning out a dumb terminal program (or possibly even a smart terminal program) is probably a waste, even though the Bee would make one of the cheapest possible terminals.

The Bee BASIC also contains a MEM token. Now in the TRS 80 this functions the same as FRE(0), and returns memory size, however I would lay odds that in

the BEE it will enable a bank select of additional memory boards.

Speculating a bit more, a truly portable computer would be nice, especially one with the Bee's text editing facilities — you would not need to carry a portable typewriter. A gel battery giving, say 9 volts, would do. Or use NiCd batteries and recharge them when power is available. Great for blackouts. You could run a portable TV monitor from the same battery pack.

You could try to cut power consumption by replacing some of the TTL chips with CMOS from the 74C series (Applied Technology even sells a variety of these). If you do try this you will note that the 74C86 and the 74C151 give rather strange results when used in place of the normal LS versions.

Zilog has announced a new low-power version of the Z80, which George Brown will be importing soon. Perhaps change the processor as well.

If a TV monitor seems to spoil the whole effect, why not wait for the new Sinclair flat screen TV, and see if that will work as a monitor. Or the Hitachi liquid crystal TV that was on display at recent electronics shows. Perhaps one of the 6 cm TVs seen recently would serve. Or go way out, and find an alphanumeric display like that used in the Craig translator.

The use of a printer alone for output has long been traditional in computing. With very small thermal printers the whole package could be compact and portable. Go way out, and use a Votrax Type N Talk as your output device. With the commands available in the Bee BASIC these are all easy to use.

The RS232 port on the MicroBee will support 1200 baud and 300 baud serial printers and by using the OUT command, you can redirect the video output, using BASIC commands, to the printer, or to a Type N Talk. Since there is a battery backup for memory, you can probably retain a small program to even let the Bee power up with output going to a printer or Type N Talk. A talking computer would certainly be something new on the block.

Try a clock speed up. The 12 MHz clock goes into a 74LS92 chip, which can provide other rates than 2 MHz. Of course, since the cassette and RS232 are under software control, these would be at a different rate also, but perhaps a 600 or 2400 baud cassette is just what you need. Or try changing the values in the 6545 video chip registers. It can produce 80 or more character displays, and twice the standard number of lines, and half height characters or intensified characters. Find out how.

While you are looking at the data sheet for that chip, find out about the pin compatible Mc6845. Or find out if a colour chip, like the 6561 used in the VIC 20, can be used via an adaptor.

While you are working on the video, how about taking a monitor, and rotating the picture tube 90 degrees, adjusting to get the characters back on the screen, and twice the number of lines. If you are into video, you might be able to imitate the displays on some of the fancy expensive word processors, or on the \$18,000 Xerox Star.

Programmers should not feel left out. There is an obvious need for a disassembler, and ones written in BASIC are not likely to prove sufficient for very long. Since the normal BASIC is a bit slow, why not write, in BASIC, a compiler that can handle integers and loop structures. Call the output via USR(X) and you could speed up your other games programs without writing them in assembler.

Get really ambitious, and look into threaded interpreted languages like Forth. There are several books on implementing Forth for the Z80. Perhaps you are the person to do it for the MicroBee. Or try for something bigger. Back in 1980 Rosetta Incorporated of Houston, Texas, had a version of Smalltalk 72 working on the Exidy Sorcerer running CP/M. If you know a Sorcerer owner, compare your HiRes graphics with their ones, and then when you are convinced that your graphic capabilities are the same, look at that language.

There is a whole world of work out there for the MicroBee. Don't spend all of your time writing a new version of Hangman.

your MICROBEE computer

By Richard Pakalnis

BUILD THE most powerful state of the art kit computer for \$399, the page yelled. Naturally, being the sort of person who believes everything he reads, I decided to read on.

I refer to the February edition of *Your Computer*, which contained a 30-page supplement on a beaut build-it-yourself micro simply called the 'Microbee'. Within minutes of finishing the article I was on the phone to Les Bell demanding he get me one at once. Since I know all about electronics and programming like Les knows about Rugby League and the history of Lithuania, I requested an assembled one.

To cut a long story short (six months later), I am now a new computer owner/user. I suppose you think I am going to go through a lengthy discourse on how I couldn't get the machine to work. Well, you're wrong. No office idiot stuff here. No sir, I got LB to test it first in his office.

He couldn't get it to work.

I went out and got the coffee. After some rational discussion we discovered we were getting no power to the unit through the power pack. Dismantled pack, found unsoldered solder; soldered solder. Voila! Mantled pack and I was sent home to learn BASIC.

If you share a flat with another person allow me to give you some advice. Buy another TV. Without going into the gruesome details I found it was necessary to buy an old black and white set.

I now have the largest computer monitor and the most expensive RF modulator in Australia (modulator — device to allow normal TV to work with computer). My modulator is a video cassette recorder. Very simple really. Computer video output lead into camera input socket. Aerial lead from VCR to TV equals display.

You see, I bought a modulator from Dick Smith the other day (\$5.50) and I forgot to ask him how to wire it up. I probably spoke with such bravado that the salesman thought I knew all about these things. I'll tell you how next month. I promise!

Let's recap for a moment before I get confused again. We have now:

1. Microbee Computer Console
2. Power Pack and cable
3. TV with modulator
4. Users Manuals
5. Faith

As I mentioned before, the micro was

bought to learn BASIC, and to one day write instructional programs. So as a beginner I found the manuals supplied were not particularly easy to follow. I say this because very early in the piece I was accosted by "...when critical scratchpads have been poked ..." (what's the capital of Lithuania?).

Being a pacifist, I ignored the page and stumbled on regardless. The manual is a bit high-brow for me. Academics writing for other academics with little thought for the complete novice. The manuals are really intended for reference use, and would work best with another text on BASIC programming such as the 'BASIC for Bird-watchers' series in YC.

Well, what have I done with it so far? I have enjoyed myself inputting some of the sample programs that were in the manual. Things like making it play tunes. Yes, folks, 'the Microbee can be easily programmed to play music through the internal loudspeaker,' like the manual states.

Then I used the combined graphics and music to produce random squares on the screen while it played a tune. Rivetting stuff... but it did show the amazing quality of the high and low resolution graphics on my simple B and W. At this stage I didn't have a clue as to what all the code that I was typing in meant but as long as it worked, that was okay by me.

The manual stated in no uncertain terms that I needed a clear understand-

ing of the terms *constant*, *variable* and *expression* before I could understand the rest of the manual. So I learned.

I learned about commands such as NEW and LIST so that together they enabled me to understand what I had been doing for the last few days. Listed below is the first program I completely understood.

```
10 PRINT "WHAT IS YOUR NAME ";
20 INPUT N1$
30 PRINT "HELLO ";
40 PRINT N1$
50 END
```

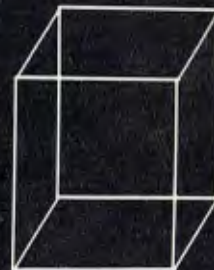
Don't you dare laugh, you didn't know how until someone showed you!

Well, since then I have graduated to bigger although not very complex programs. I learnt about the AUTO line numbering facility which saves lots of time and effort during program entry. Type in AUTO and the Microbee automatically numbers lines from 100 in steps of 10. Type in AUTO 200,100 and it starts your coding lines at 200 in steps of 100, and so on.

What was I going to do with all my programs that added and multiplied and printed? What was going to happen when I turned my Microbee off? Was it all for nought?

No sir, my little machine has a wonderful affliction called 'Complementary Metal Oxide Semiconductor Random Access Memory' which means it can be switched

```
06000 REM This subroutine draws a square of lengths l1,l2
06005 REM with the bottom corner at a1,b1
06010 VAR(A1,B1,L1,L2)
06020 REM Draw left side, then top, then right, then bottom
06030 GOSUB [ A1,B1,A1,B1+L2 ] 4000
06040 GOSUB [ A1,B1+L2,A1+L1,B1+L2 ] 4000
06050 GOSUB [ A1+L1,B1+L2,A1+L1,B1 ] 4000
06060 GOSUB [ A1+L1,B1,A1,B1 ] 4000
06999 RETURN
65000 END
```



off and moved to some other place without losing programs or data. I simply switch it on and keep on going. It has a small battery inside to keep the insides in.

I'm glad you mentioned saving and loading files. I learnt that too. Like all my other purchases I went looking for the cheapest possible cassette player I could find that would be suitable. I finally bought a Thorn for \$32 and it worked perfectly after I sorted out the play and record cables. So SAVE and LOAD have been added to my ever-growing vocabulary.

Now my problems began. Here I was, ready to load and save programs all over the place (copied and created), but shouldn't it be possible to leave a few programs inside the machine without re-loading off cassette?

Having Les Bell for a friend does have its small rewards so I rang him. I was granted an interview and he patiently detailed on paper a short program which solved my dilemma.

What I needed to do was to make my short programs part of a much larger one.

I understood immediately so I asked him again. Basically (nice one, Richard — Ed) it meant preparing a menu. The menu would display the programs I wanted to call on, and jump to the right one. The programs would start with different levels of line numbers.

Example: program one would start with line number 1000, program two would start with line number 2000, and so on. I would then use a simple piece of coding to make each program a subroutine. Jumped the gun haven't I — but by the time you read this I will have learned about subroutines and if statements. This little item will be of help to you if you were having the same problem/idea as me.

Here is that listing:

```
100 CLS: PRINT "MENU SELECTION
ROUTINE"
110 PRINT "1 - PROGRAM 1"
120 PRINT "2 - PROGRAM 2"
130 INPUT N: IF N
1 OR N
2 THEN 100
```

```
140 ON N GOSUB 1000, 2000
150 GOTO 100
```

```
1000 CLS: PRINT "THIS IS PROG
RAM 1"
1010 INPUT "HIT RETURN TO
CONTINUE":A$
1020 RETURN
```

```
2000 CLS: PRINT "THIS IS PROG
RAM 2"
2010 INPUT "HIT RETURN TO
CONTINUE":A$
2020 RETURN
```

All I have to do is remember to update the coding to include new programs and all will be well. I hope.

With all this new input to my brain I have developed a headache. See you next month and I'll reveal a nifty little facility on the Microbee called a Global Search. Ciao. □

(Editor's note: The capital of Lithuania is Vilnius. So there...)

PEACH

Continued from page 91

appearance to the display and should always be used unless you want to use the graphics characters, which are only available in the 'interlace off' mode.

The n1 figure sets the high (1) or normal (0) resolution mode. Similar to the WIDTH command a change from high resolution to normal resolution is always allowed since this requires less memory for display but the reverse is only allowed if sufficient memory was set aside for display at the time of power up.

When more memory is available for display than is required for a single screen display then the available memory is automatically divided into a number of screens (or pages) and we can select any one of these using n2. Since we can rapidly change from one page to another without clearing each page (by not specifying n1 — for example, SCREEN ,2,0) we can create some spectacular graphic effects.

The program listed in Figure 2 is an example. Before running the program you must execute 'NEW ON 7' to set aside sufficient memory to allow the display memory subsequently to be split up into 8 pages.

You then type in the program or load it from cassette or disk and run the program. It first draws a number of wheels on each of 8 pages with each wheel rotating slightly on each succeeding page. Rapid switching of pages then results in a motion effect, which can be quite impressive.

You could, for example, have a series of cars racing around a track or coming out of the screen! □

```
10 *****File name "PEACH.S"
20 *****Screen switching demonstration by Bob Swainford.
30 *****The program requires that you execute "NEW ON 7"
40 *****then FOR "PEACH.S" which runs the following program.
50 *****
60 SCREEN ,2,0,0,0
70 REM...Draw 4 wheels on each screen
80 FOR A=1 TO 4
90 SCREEN ,2,0,0,0:PRINT "SCREEN 1"
100 FOR B=1 TO 50
110 X=200:Y=200:R=100:G=200
120 X=X+20:Y=Y+20:R=R+10:G=G+10
130 X=X+20:Y=Y+20:R=R+10:G=G+10
140 X=X+20:Y=Y+20:R=R+10:G=G+10
150 NEXT B
160 NEXT A
170 REM...Clear the screen
180 FOR A=1 TO 8
190 FOR B=1 TO 8
200 SCREEN ,2,0,0,0:PRINT "SCREEN 1"
210 NEXT B
220 NEXT A
230 REM...Draw 4 wheels on each screen
240 FOR A=1 TO 4:STEP 1/8
250 X=X+20:Y=Y+20:R=R+10:G=G+10
260 X=X+20:Y=Y+20:R=R+10:G=G+10
270 X=X+20:Y=Y+20:R=R+10:G=G+10
280 X=X+20:Y=Y+20:R=R+10:G=G+10
290 NEXT A
300 NEXT B
310 NEXT A
320 NEXT B
330 NEXT A
340 NEXT B
350 NEXT A
360 NEXT B
370 NEXT A
380 NEXT B
390 NEXT A
400 NEXT B
410 NEXT A
420 NEXT B
430 NEXT A
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I Bought A Bee



By Colin Johns

WHICH computer to buy to learn about programming (and play a few games)? After looking at many systems under \$800, I saw the February edition of *Your Computer* and thought the Microbee looked to be the answer.

I placed an order; and waited, and waited... Three months and several broken promises later a neat, white cardboard box arrived. Here at last!

The box contained three books, a 24-page construction manual, a 27-page BASIC Tutorial and a 110-page BASIC Manual. All gave the impression of having been printed on a typewriter and then reduced, and although the print is clear it certainly is small!

Along with the books was a no-apologies service coupon which offered to refund the purchase price within fourteen days if you are not satisfied (providing no packages have been opened) and also offering to complete the construction of the unit for \$50 if the buyer considered the kit was too difficult to assemble.

Considering the amount of work involved and the problems I had with missing components, this is a real bargain and it would be most sensible for any purchaser to seriously consider buying a completely built unit. It would also mean much easier resale at a later date if the Microbee is not satisfactory for your application.

My kit included a sheet of modifications which had to be made to my unit, but unfortunately none of the modification parts were included and since this included the power regulators which are among the first stages of construction it meant another delay (and an STD call to Gosford to order the missing parts).

The 'core' memory board comes fully constructed, which leaves the kit builder with only the main PCB to be assembled. The large double-sided board was of good quality, silk screened with component numbers and so on and thoroughly coated with solder resist which in view of the number of minute tracks and solder connections was just as well.

This is not a board for the beginner to solder as there are over 750 fine solder joints to be made and many components to be identified. Due to the missing parts and the modifications the construction manual was largely useless (the unit now has twin power regulators, presumably to clear the background hash visible on some early machines).

However, my unit was soon running and produced nice clear characters on my monitor (note you must have a monitor or a specially modified television set as the unit has no video modulator).

In use, the keyboard feels quite nice and the keytops are excellent, but it is difficult to touch-type as the keys have no definite 'feel' and random keys produce doubles even with a very short, light depression. Hopefully this will not occur in fully built units as there are already modifications listed for the keyboard circuits such as adding a capacitor to the strobe line. One problem with the keyboard is that the keys are flat and are not angled as in a typewriter.



After a back-up battery was installed (not provided) the advantages of a non-volatile memory became obvious and it is great to be able to stop a long programming session and know that all of your program will be intact at switch-on (I have found the occasional dropped bit, but this seems to be due to switch-on/off transients).

The number of commands the system supports is really excellent and I have not found any other unit in its price-range which supports all its commands. The search and edit features make changes quite easy to implement.

The graphics facilities are excellent, but the absence of any character listing with the unit makes it very hard to know what codes are needed for each character unless you can output the graphics set for a printer for a hard-copy reference.

However, all the great Microbee fea-

tures have been negated, for this purchaser at least, by the implementation of a non-standard assignment of numeric and string variables. Only integers can be assigned a single letter, and all real variables must be assigned a letter then a number then a dollar sign — for example, A, B, C for integers, D1, E0, F6 and so on for real numbers and H1\$, J5\$, L0\$ for strings.

You must be very careful not to use the same letter for numbers and strings and you must not use the \$ sign to assign a string in a dimension statement. This feature has caused this budding programmer no end of trouble and it is a shame that a Microbee user cannot directly enter any of the thousands of programs found in the many computer textbooks on sale. It is true that recorded cassettes are available at \$6.95 each but this can be pretty expensive.

A MicroWorld report newsletter which arrived soon after the Microbee does contain a few interesting programs, however. Perhaps some genius out there will come up with an easy way to recode other programs.

When completed, the Microbee looks very neat in its black plastic case. It is only 240mm deep and 340mm wide so it takes up very little space. The power supply is a separate plug-pack unit which becomes very warm in operation.

There is room on the core board for two extra ROMs and up to 32K of memory, but the board has to be returned for the extra memory to be added. There is no room inside the Microbee case for any other expansion and the power supply would be hard pressed to cope with any more power drain.

The circuit diagram supplied with the Microbee is not very clear and troubleshooting is almost impossible without extension plugs and sockets as the core board sits directly over most of the ICs in the unit.

In summary, then, the best features of the Microbee are its small size, low cost, comprehensive instruction set, easy expansion and a comprehensive character set.

The worst features are non-standard numeric and string assignments causing non-compatibility with already written BASIC programs, a dubious power supply, unreliable keyboard and a rather inadequate instruction book which leaves many questions unanswered. □

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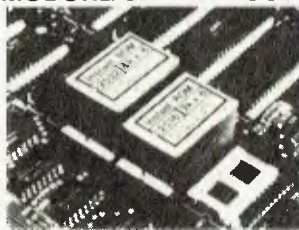
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